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CONTENTS

[III - USSR - 4]

GERMAN SOURCE ON TANK DEVELOPMENT, 1950-1980

Frankfurt/Main SOLDAT UND TECHNIK in German No 8, Aug 82 pp 448-453

[Part II. Development of Component Technology]

[Text] The turret compartments of the second postwar generation of battle tanks were still made of cast homogenous armor (Fig. 90e-i); the roof parts were made in part of hot rolled steel. Only the Vijayanta battle tank, designed by the Vickers firm for the Indian army, had a turret built (quite disadvantageously) of hot rolled steel plates. To balance the weight of the main weapon and the frontal armor of the turret, some of the Western tank turrets showed considerable bustles, so that a distinct increase in the length of the turret compartment can be noted. Only the turret of the Soviet T-62, as opposed to that of its predecessor T-54/55--in spite of having a larger main weapon--was only slightly enlarged. (Fig. 90 i and d). A satisfactory shape, protective against frontal fire, could only be achieved in the turrets of the T-62 and the Chieftain, while the basis (approximately 2.5 - 2.7 cm) necessary for an optical range finder had a negative effect on the shape of the respective turret compartments (this is especially true when the range finder is operated by the gunner and thus has to be housed in the front part of the turret).

The turret opening and its cover (shield) represent the weak spot during extreme threat. Here, too, the Chieftain with its shieldless weapon installation, which--in the opinion of British experts--offers optimal protection, represents an extraordinary solution to the problem. Another construction philosophy was followed in the M 60, AMX 30 and Leopard 1: here the possibility of quick weapon mounting and dismounting was the primary concern in the layout of the opening.

In a few battle tanks of the interim generation, the dual compartment armor known as the Swedish "S" was used in turret tanks also. From the outside this is less noticeable in the chassis than it is in the shape of the turret: since the partition armor could be more easily realized when hot rolled iron plates were used, a number of battle tanks were equipped with welded turrets in the 1970's (e.g., Leopard A 3/4, Fig.90 n). While the high performance requirements on Western battle tanks of this epoch led to the continuous increase in compartment dimensions, the dimensions of Soviet battle tanks could be kept nearly even by limiting the performance level in

those components which determine mobility. This is shown in a comparison of the hull and turret compartments of the 70 and T-72 (Fig. 89 k, i and 90 k, o). Because of a combat weight of 41 tons due to a compact sized compartment and the slightly slanted frontal plate, the T-72 must offer a high degree of protection—especially in the front. Because of the low-lying nose tip, the upper frontal plate shows a relatively large frontal projection surface (Fig. 89 i).

Through the more favorable shape alone, even without greater plate strength, the T-72 would show a nearly 50 percent improvement in frontal protection as compared to the previous models.

Soviet manufacturers apparently expected increased flank protection against HL projectiles from the hinged skirting on the T-72 chassis. Indeed, more distance and an even greater interference with the HL prong can be achieved under favorable conditions (Fig. 91 c). On the other hand, the hinged skirting loses its protective power when the attack angle becomes bigger. This was possibly the reason why later T-72 models were equipped with traditional skirting.

The use of new protective technology and new components (e.g., laser rangefinders, and automatic loaders) led to a greater variety of turret shapes in the turrets of interim generation tanks (Fig. 90 k to o);

-- accommodation of the entire crew (three men) in the turret, with the driver placed in a driving seat which revolved independent of the turret;

-- integration of a 20 mm machine cannon which could be aimed (and collapsed) independent of the turret;

-- installation of an automatic loader with a 26-round belt magazine in the bustle;

-- use of bulkhead armor and radiological armor;

-- installation of extensive reconnaissance and sighting equipment.

In spite of high integration density, the above-named conditions resulted in a turret of above-average size; (Fig. 90 k); turret weight was approximately 19 tons!

A completely different construction philosophy can be noted in the M 60 A2 tank turret (Fig. 90 l): here, a narrow turret structure was combined with a wide base (it accommodated the pivot bearing). Using the same main weapons system as the battle tank 70 (152 mm combination weapon), the armor-coated volume in this turret could be reduced considerably, or rather it could be used for localized strengthening of armored protection (turret weight: approximately 17.1 tons).

A similar construction principle can also be seen in the turret of the Israeli Merkava tank (Fig. 90 m). The generously sized bulkhead armor in front and

the large rear side led to a considerable turret length of approximately 5.10 m.

The Soviet T-64/72 battle tanks have the smallest turrets within the tank models of this segment of the development. The clever integration of the automatic loaders for the main weapons system in these tanks made it possible to reduce the crew to two men. Since the two crew members are seated, the height of the turret ("standing height for cannon loader") no longer had to be taken into consideration, the floor could be elevated to accommodate a 22-round magazine underneath. It can be assumed that the frontal armor of the turret has at least the same penetration depth as that of the chassis: by eliminating the customary telescopic sight, the break in armor necessary for it (= weak point) in the frontal armor of the turret next to the main weapon opening could be avoided.

For the battle tanks of the third postwar generation, the important tank-building nations began in the 1970's with the development of so-called special armor, in the form of multiple-ply armor or combination bulkhead armor. As early as mid-1976, the so-called Chobham armor, which is a combination armor consisting of steel, ceramic and aluminum parts was introduced in England: it is said to offer greater protection against KE and CE projectiles while weighing less. The Chobham armor was used in the beginning of the 1980's in the Valiant and the prototypes of the future British Challenger tank. The further developed combination bulkhead armor using armor steel and other metals was used in the Leopard 2.

The sudden progress in the area of protective technology has had the result in a few Western nations that the race in ammunition effectiveness, which had been abandoned, temporarily, was taken up again. In the M 1, Leopard 2 and Challenger, it can be expected that no penetration will occur from a large part of today's antitank weapons at up to medium ranges, at least not from the front or the side (up to certain side angles). However, achieving the maximum performance in terms of protection, weapons and mobility has led to relatively large turret dimensions (Fig. 89 m, n and 90 p, q), and to an increased combat weight of 55 to 62 tons.

At present, there is only enough technological know-how to manufacture special armor in flat surfaces. For that reason, especially the turrets of the third postwar generation show the typical large-surface outer contures with long, straight edges. This is especially noticeable in the turret of the British P 4030/3 (Fig. 94).

While alloy armor has become customary since the beginning of the 1960's for numerous auxiliary vehicles (e.g., the M 113, M 114, M 109, Fox, Scorpion and AMX 10), it could not be used in battle tanks because it does not offer sufficient protection against KE projectiles. Only in combination with the already mentioned Chobham special armor did the British Vickers firm for the first time make the attempt to use alloy for turrets of battle tanks with the Valiant prototypes (Fig. 95) introduced in June 1980 in Aldershot. The self-supporting hull of the 43.6 ton Valiant consists of alloy plates made by the Alcan firm: Chobham armor is adapted to the sides and front of it.

Independent of this alloy-Chobham armor combination, this principle of adapted armor (Fig. 96), used for the first time in the Valiant, shows a number of advantages:

-- materials suitable for the various functions (driving stress/firing stress) can be specifically selected;

-- the outer parts can be attached to the inside shock-dampened (Leopard A1 A1 with added turret armor);

-- the outer skirting protects the sensitive suspension parts more effectively than before;

-- damage can be repaired quickly through the exchange of individual plates;

-- in a noncombat situation, the heavy outer armor can be eliminated.

Future battle tanks will possibly return more and more to this tank construction; the Leopard 2 and M1 can be considered transitional solutions, since they have integrated as well as adapted armor. The use of the highly protective (and correspondingly heavy) skirting conceivable for the future will, however, lead to certain problems (hamper the self-cleaning action of the suspension and its accessibility for maintenance and repair etc.).

In summary, it can be said that the battle tanks of the first postwar generation, because of their compact turret design, showed a relatively high degree of armored protection which was able to prevent piercing by those projectiles which were available at the beginning of the 1950's. After the low-caliber-propellant cage projectile became widely used, there was a split philosophy concerning the layout of the second postwar generation of battle tanks: in some it was attempted to meet the greater challenge from ammunition with more effective armor (e.g., Chieftain), while in other models the race between ammunition and armored protection was abandoned (e.g., AMX 30, Leopard 1). In the tanks of the interim generation, the protective properties could be improved with the use of bulkhead armor (e.g., AMX 32, Leopard A4); however, the varying tank philosophies continued to exist. Only in the third postwar generation of battle tanks could a tendency be noticed in numerous nations toward returning to the race with ammunition effectiveness. The development of modern special armor permitted the realization of absolute protection against most of the antitank weapons of the time on those parts of the vehicle which are most highly threatened--although at the cost of a (just barely) justifiable increase in weight. After the United States, Great Britain and the FRG had pointed the way in this direction, it remains to be seen how far this philosophy will be followed by other nations (e.g., France, Japan and the Soviet Union) for future tanks of the third postwar generation.

Other Protective Measures

NBC protective measures were not planned for the first postwar generation of battle tanks. In the overwhelming majority of the second postwar generation

of tanks there was installed an NBC protective ventilation system with gas and particle filters which was capable of supplying the fighting compartment with filtered air, building up an excess pressure of approximately 3-4 mbar. However, this type of equipment does not offer the crew complete protection against the threat of ABC weapons. While ABC protection was improved in some of the tanks of the interim generation (70, T-64), other tanks of this epoch (e.g., M60A2) still offered insufficient NBC protection. Like the T-62, the T-72 has a hatch in the turret ceiling for throwing out empty casings. This elimination process occurs automatically on recoil of the main weapon; this makes the maintenance of excess pressure in the fighting compartment impossible. On the other hand, the fighting compartment in the 70, T-64/72 was equipped with a special liner for absorption of neutron rays, to have the T-64 offer the most extensive NBC protection of all battle tanks in use today. It cannot be understood why the NBC protection of currently introduced (Western) battle tanks of the third postwar generation are again limited to the installation of a ventilation system (and the protection against x-rays coming from the armor). In unfortunate cases, hits on the fuel or oil tanks or ammunition can lead to a complete loss of crew and vehicle (catastrophic kill). The danger of explosion could be drastically reduced in the second postwar generation of battle tanks by changing from Otto to Diesel engines. Further improvement in fire protection could be achieved through the installation of an automatic fire-extinguishing system in the engine room. This is especially true for those combat vehicles in which, toward the end of the 1970's, the previously used extinguishers (carbon dioxide, monochlorbrommethane etc.) were replaced by the more effective halon 1301. Self-sealing fuel tanks made of rubber with foam lining were first used in the British Chieftain tanks, to prevent bursting of the containers; fuel tanks of the Leopard 2 and M1 have a similar construction.

As the Yom Kippur war of 1973 has shown, the electrohydraulic turret sight device installed in the fighting compartment represents a considerable danger for crew and vehicle. If circuits under pressure are destroyed by shrapnel, a highly explosive oil-air mixture forms instantly. To reduce this risk, the following measures were taken in some of the battle tanks of the interim generation and the third postwar generation:

-- replacement of hydraulic oil by an almost nonflammable hydraulic fluid (M 60);

-- use of electric gun controls (Centurion, Chieftain, Valiant);

-- bulkhead-armor-protected storage of the hydraulic energy supply outside of the fighting compartment (Merkava, Leopard 2);

-- installation of an explosion-suppressor device with optical sensors (planned for Merkava, M 1).

By using optical sensors, the explosion-suppressor device can trigger the extinguisher into action approximately 5/10,000 second after the explosion. This process is completed 150 ms later. In general, explosions can be suppressed so quickly that irreversible injury (burns, pressure) to the crew

can be avoided. This means that installing this type of equipment represents an economical means of improving the survival rate of existing vehicles, while the planned installation in the construction of future vehicles should generally avoid the risk of explosions in the fighting compartment for the future.

Finally, projectiles filled with explosives (HE, HESH and HEAT) as well as propellent charges within the vehicle represent a considerable danger. In addition to direct hits, even impacts from shrapnel (above a certain mass and temperature) suffice to trigger a deflagration of the propellent charges. The ignition of charges stored next to them often leads to a complete loss of crew and vehicle. The use of the above-mentioned explosion-suppressor installation is not successful in this instance, because the propellent-charge powders have their own oxidators and the reaction takes place independent of oxygen concentration.

It is interesting that measures to protect ammunition were used even in some first postwar generation of tanks; e.g., in the T-54/55 the ammunition was stored in chambers within the fuel tank. It was hoped that the diesel fuel surrounding the ammunition would have a cooling and extinguishing effect on possibly entering shrapnel and thus prevent a reaction of the charge. Based on the tendency of Soviet battle tanks to burn rapidly and explode, as seen in the Middle Eastern wars, this concept was not convincing.

A more effective ammunition protection was first realized in the Chieftain through the storage of the propellent charges in so-called "water jackets." Fig. 97 shows the construction principle of such a protective system. By changing from metal casings to combustible (or partially combustible) casings for propellent charges in numerous tanks (Chieftain, M 60 A 2, T-64/72, Leopard 2), the sensitivity of the ammunition against outside fire could be clearly reduced; however, in some cases this gain was offset by the use of powders having a very high heat content.

Since the storage of the cartridges in the water jackets takes up too much space, the reserve ammunition was stored in bulkhead-steel-protected chambers outside the fighting compartment in some third postwar generation tanks. The outer surfaces of the ammunition chambers show present breaking points and are blown off in case of a deflagration of the propellent charges, to avoid an unduly high increase in pressure. Some of the blowoff openings in the turret roof of the M 1 and Leopard 2 can be seen in Fig. 90 p, q.

Many of the described measures are not new, e.g., the Hetzer tank destroyer of the former German Wehrmacht already showed pressure reduction openings in the floor of the hull underneath the gasoline tanks--the chassis comes from the Czechoslovakian THNP of 1938.

The water jackets were also used as early as 1944 in the U.S. Sherman (M 4 A3); a mixture of ethyl alcohol, glycol and water is said to have served as extinguisher for ammunition protection.

Forming the Concept

Basic conceptual measures to increase survival capability of crew and tank have been considered only hesitantly and only in very few battle tanks during the timespan under consideration here. Although in the past 30 years the threat to armored vehicles on the battle field has increased drastically, both through the improvement of known antitank weapons (KE and CE projectiles), and the use of new weapons and weapon carriers (antitank helicopters, guided missiles, final-stage guided ammunition, diffusion mines), the basic construction of modern battle tanks is hardly any different from that of the Soviet T-34 (Fig. 98) which appeared 41 (!) years ago. In general, the increased turret threat was met with an increase in armored protection and, in some vehicles, with above-average mobility.

A first noticeable exception is the Swedish "S" tank introduced in 1966. The transition from the traditional turret tank to a casemate concept with a rigidly mounted main weapon and automatic loader made possible the separation of the mixed compartment--consisting of the room for crew, weapon and ammunition (= fighting compartment)--and a threat-oriented layout of these rooms including the engine room. The "S" excels through the following characteristics:

-- low silhouette;

-- favorable shape with a minimum of trapping spots;

-- small fighting compartment; low-lying accommodation for crew;

-- favorable ammunition storage low in the rear of the vehicle;

-- all ammunition (50 rounds) available in the automatic loader; high rate (15 rounds/minute);

-- redundant driving and aiming elements for the crew;

-- reverse driver with autonomous sight and operational elements.

The increased survival capability for crew and system resulting from these measures needs no further comment. In addition, the compact fighting compartment and the absence of a revolving turret offers armored protection which is above average for this weight category. However, the coupling of driving and fighting direction which is part of this concept leads to a limitation of the tactical deployment spectrum for this vehicle.

Not until 1978 did there appear another tank, the Israeli Merkava, which differed from the generally customary concept. The front-driven tanks show the following characteristics which have a positive influence on survival capability:

-- moving the fighting compartment to the center of the vehicle;

-- utilization of as many components as possible for additional protection for the fighting compartment (front: engine, sides: suspension, fuel tank; rear: batteries, ABC ventilation installation etc.);

-- a protected emergency exit for the crew in the rear.

The frontal protection of the turret remains a problem, because here the only protection is armor without the use of additional components. The turret of the Merkava is relatively small and the frontal section has hulkhead armor. In addition, the vulnerability of this tank was reduced to a minimum through numerous individual measures such as:

-- the use of self-sealing fuel containers;

-- storage of ammunition in the rear of the hull in heat-resistant containers;

-- storage of hydraulic energy supplies separate from the fighting compartment in the rear of the turret;

-- the use of bulkhead armor in the front and on the sides.

The use of the air-cooled Continental AVDS-1790-SA-diesel engine proved favorable since no additional cooling installation had to be put into the rear area. The large rear exit not only allows for quick rearming (critical phase in combat), but in an emergency also for the transport of casualties or crew members of tanks which are out of action.

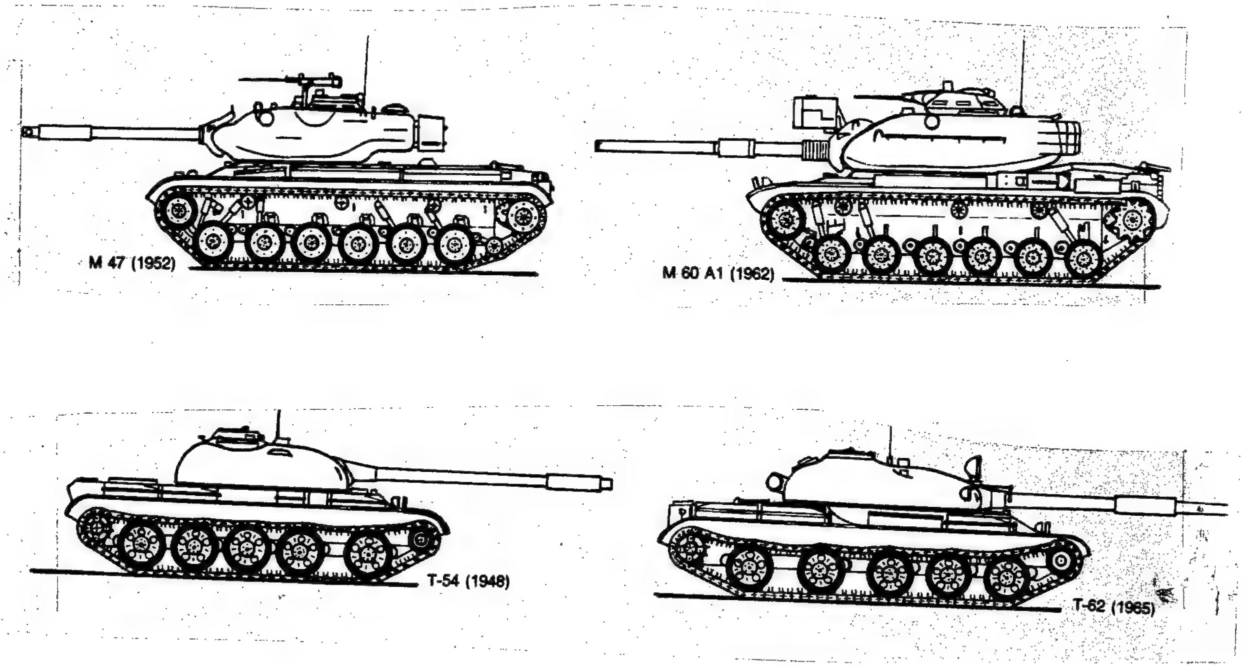
The high priority of fighting-compartment protection and the possibility for the crew to leave the vehicle quickly and under protection no doubt have a positive effect on combat morale. Effective frontal armor of the chassis must assure that the probability of a so-called "mobility-kill" through destruction of the engine remains limited to exceptional cases.

The Swiss "New Battle Tank" (abandoned in the meantime) was to be similar to the basic concept of the Israeli Merkava: here, too, the engine in the front of the hull offered additional protection for the fighting compartment against frontal threat. In contrast to the Merkava, the Swiss tank was designed for a 3-man crew and automatic loader for the main weapon; this would have enabled bulkhead armor protection between the ammunition supply and the fighting compartment. No rear exit was possible because of the planned integration of the 44-round beltloader and the fluid cooling system of the 990-kW diesel engine in the rear of the hull.

For the sake of completeness, let us refer to the light TAM tank developed by the Thyssen-Henschel firm for Argentina. It also has front drive. But the total concept was based less on protection than on the use of the Marder chassis developed by Thyssen-Henschel.

Aside from the four vehicles described ("S", TAM, Merkava and the Swiss New Tank), all other tanks of the past 30 years showed the basic characteristics

of the turret tank concept known for more than 40 years (revolving turret with fighting compartment in the front of the chassis, engine block in the rear. The relentlessly increasing threat to armored vehicles, on the one hand, and the ever greater weight problems, on the other, will have to lead in the future to a greater adaptation of the overall concept to the changed conditions.



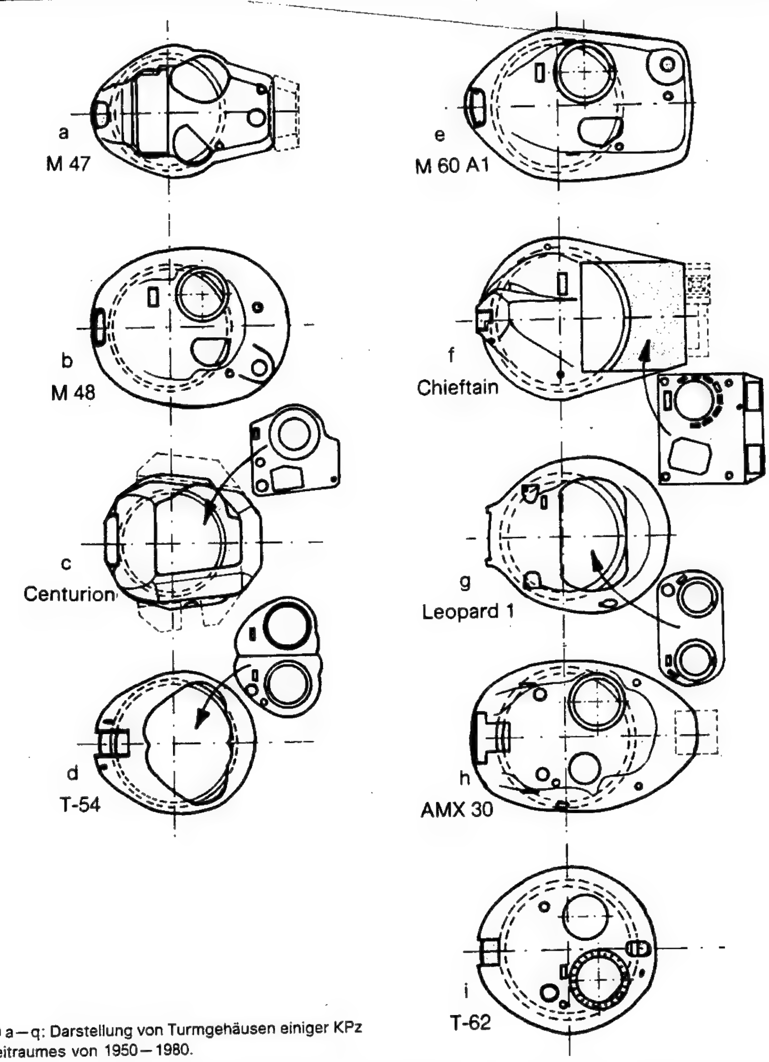
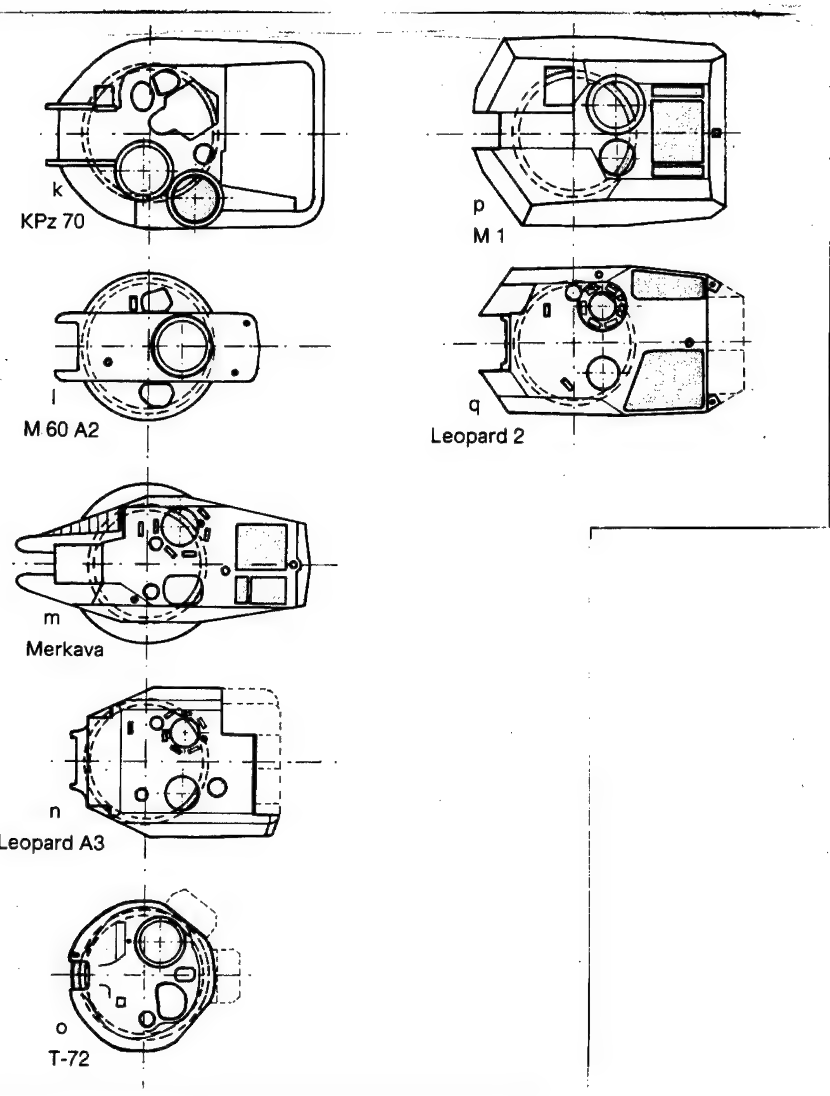


Bild 90 a–q: Darstellung von Turmgehäusen einiger KPz
des Zeitraumes von 1950–1980.

Fig. 90. Fighting compartments of some of the battle tanks from the time 1950 to 1980.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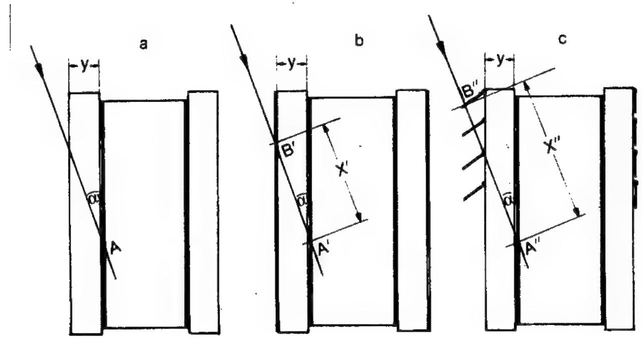


Fig. 91. Mechanisms of suspension skirting or hinged skirting during flank attack from a high explosive antitank shell:

(a) without additional protection, the shell impacts on the main armor at Point A with full penetration power.

(b) With suspension skirting, the high-explosive antitank shell ignites at Point B, which is approximately 1,800 to 3,500 mm in front of the actual impact point at the main armor (A'). The penetration effect of the shell decreases as X' increases.

(c) by flipping out the skirting, the "stand off" to the main armor can be increased even further as long as a is small. (X" > x').

Fig. 92. [Photo omitted] Construction of the Chieftain (here model P4030/2, destined for Jordan). The picture shows the optimal shape of the cast hull front.

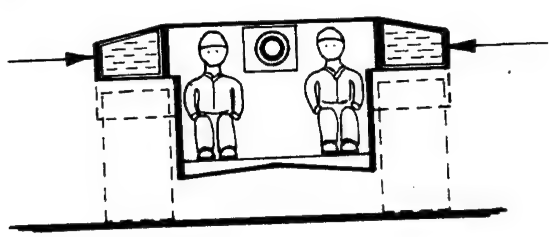


Fig. 93. The side bulkhead armor in the fighting compartment area of the Swedish "S" tank. By adding suspension skirting, the principle of bulkhead armor could also be realized for the lower-lying parts of the fighting compartment.

Fig. 94. [Photo omitted] Frontal view of the British P 4030/3 tank: Chobham armor added to the hull and turret compartments are clearly recognizable. This special armor could be manufactured only as straight surface to this day.

Fig. 95. [Photo omitted] Prototype of the Valiant of 1979. The vehicle was designed from the start to be equipped with Chobham armor. In contrast to the P 4030/3, its ballistic weak point (in the area of sighting devices for the driver) and its limitation on driver visibility could be avoided here.

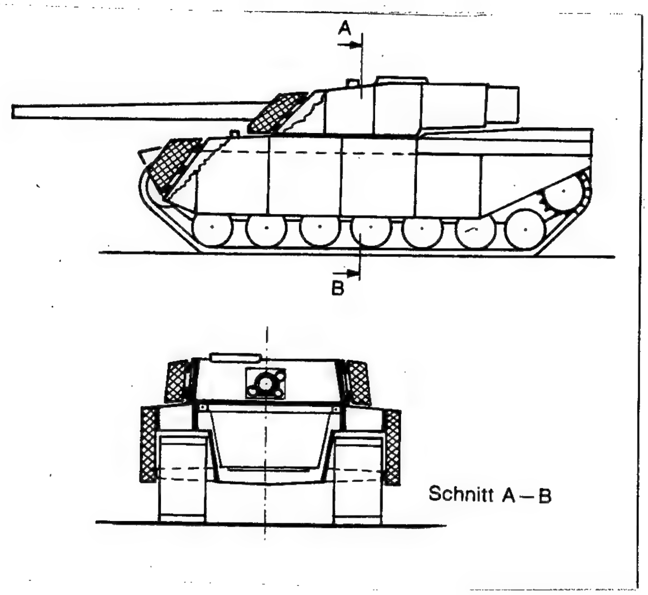


Fig. 96. Principle of tank with adapted armor front and sides. The picture shows that the use of this technique leads to problems, among them with the accommodation of the driver, ground-visibility range for the driver and maintaining railroad loading dimensions.

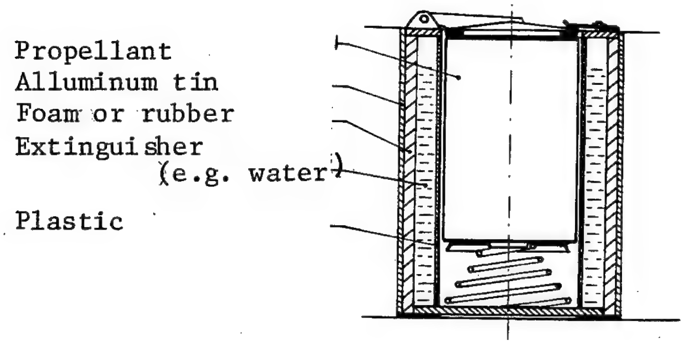
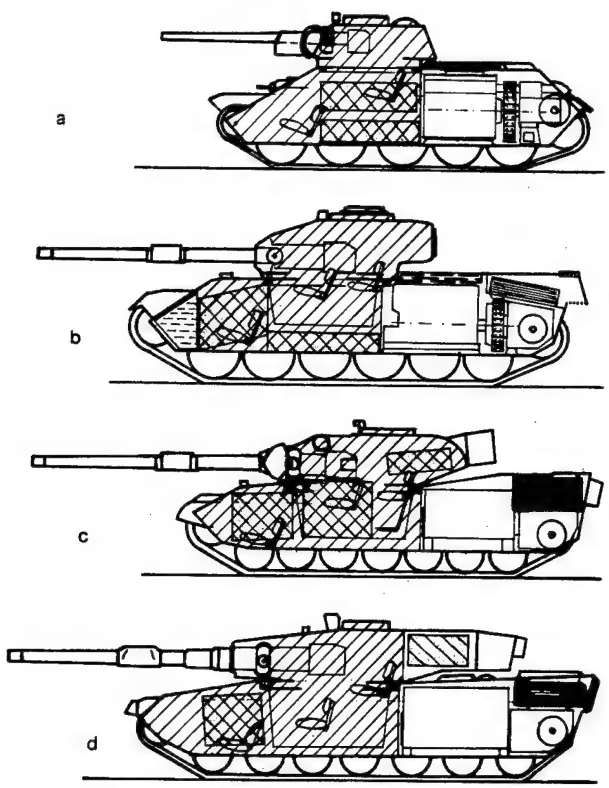


Fig. 97. Construction principle of a "water jacket" for a bag propellent charge. The propellant is surrounded by a container which is under internal pressure and filled with an extinguisher or cooler (e.g., water). The material for the water container must be such that the opening caused by shrapnel is closed as quickly as possible, while causing as large a hole as possible in the inner wall to allow for the free flow of water to the propellant.



(Caption for Fig. 98 on following page)

Fig. 98. Comparison of the basic concept of some battle tanks showing fighting compartment ///// and ammunition compartment\\\\

(a) T-34 (1940) (b) Centurion 5 (1952) (c) Leopard 1 (1965) (d) Leopard 2 (1979).

This picture shows that the basic concept known since 1940 has not changed until today.

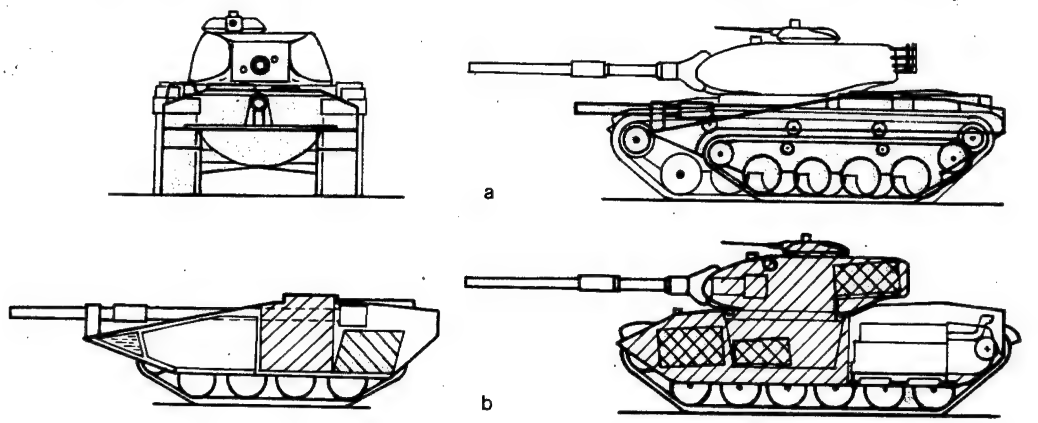


Fig. 99. Comparison of the traditional turret concept (m 60 A1) with a casemate tank (Strv 103).

(a) Comparison of silhouettes

(b) Comparison of fighting compartments /////// and ammunition compartments\\\\\\

Ammunition: M60 A1: 57 rounds
Strv 103: 50 rounds.

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Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE (Foreign Military Review) in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 1-2

[Full-text translated articles published in this report are indicated with an asterisk (*); excerpted translation -- with a double asterisk (**)]

[Text] Contents Page

The articles by Soviet authors and the chronicle are based on materials in the foreign press. This issue contains illustrations from "Jane's" and the following journals: AVIATION WEEK AND SPACE TECHNOLOGY, AVIATION AND MARINE, ARMADA, DEFENSE ATTACHÉ, INTERNATIONAL DEFENSE REVIEW, MILITARY TECHNOLOGY, NAVIGATION, NATO'S 15 NATIONS, NAVY AVIATION NEWS, PROCEEDINGS, FLIGHT, FLUG REVUE, AIR FORCE, and OESTERREICHISCHE MILITAERISCHE ZEITSCHRIFT.

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PERCEPTIONS, VIEWS, COMMENTS

COMMENTS ON SCANDINAVIAN COUNTRIES IN U.S. AND NATO PLANS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 7-15

[Article, published under the heading "General Military Problems," by Engr-Col I. Belov: "The Scandinavian Countries in U.S. and NATO Plans"]

[Text] Imperialist circles in the West have always attached great importance to establishing control over Scandinavia, which occupies an advantageous strategic position. Such was the case in particular at the beginning of World War II, when fascist Germany hastened to occupy Denmark and Norway. Today U.S. and NATO militarists are following Hitler's lead, transforming a number of Scandinavian countries and their territories in the North Atlantic into a bridgehead for carrying out aggressive schemes against the Soviet Union and the other nations of the socialist community.

Having enmeshed Denmark, Norway, and Iceland with military bases and binding them by means of various obligations within the framework of NATO, they have placed these countries under rigid control, have drawn them into the arms race, and have proceeded to build on their soil various military installations for U.S., British, and West German forces, to be redeployed into this area "in case of emergency."

This militarist policy is costing the Scandinavian countries dearly. In 1949, when Denmark and Norway were drawn into the aggressive NATO bloc, the military appropriations of each of these countries ran approximately 350 million crowns, while in 1980 they spent more than 8500 million, that is, 25 times as much. Today Norway is surpassed in military expenditures per capita in NATO only by the bloc's largest imperialist countries. Such are the sad fruits of a policy of militarism, an unchecked arms race, and disregard of national interests.

The United States and NATO are extensively utilizing not only Denmark and Norway proper but also their islands in the North Atlantic and Baltic Sea, including such a vast territory as the Danish island of Greenland, the island of Bornholm and the Faeroes, as well as the Norwegian islands of Jan Mayen and Bear Island.

As is emphasized in the Western press, Iceland does not maintain its own armed forces, but its territory is actively utilized by U.S. and NATO leaders for military purposes.

The Pentagon militarists would also like to attach to the NATO bloc the largest of the Scandinavian countries -- Sweden. They are drawn by its considerable military and economic potential, as well as its advantageous strategic position. However, they are forced to consider its policy of neutrality. In response to all their importunities, in November 1981 Sweden's prime minister reaffirmed that country's intention to continue following its chosen course. In spite of this fact, some U.S. and NATO officials are inclined to consider Sweden as a reserve force, and apparently they do not exclude the possibility of violating its neutrality. The Scandinavian public concluded precisely this when in 1980 the Pentagon purchased detailed maps of Northern Sweden to be utilized in cruise missile guidance systems. It is not difficult to guess the target of such missiles contour-flying over Swedish soil -- the Soviet Union.

Finland's peace-seeking foreign policy presently prevents the NATO generals from utilizing its territory in their military preparations.

In carrying out an extensive aggregate of measures to militarize NATO's Scandinavian member nations, U.S. and NATO leaders are forced to consider certain specific features of their policies, in particular the decision by Denmark and Norway not to allow the stationing of foreign troops and nuclear weapons on their soil during peacetime. They are also aware of the existence in this region of continuing conflicts between the FRG on the one hand and Denmark and Norway on the other. The principal cause of these conflicts lies in West Germany's endeavor to take a dominant military position in the Baltic straits zone, and subsequently throughout the entire Northern European theater. The peoples of these countries, however, have not forgotten the fascist occupation during World War II and have no desire to be the victims of another occupation. Nevertheless the process of strengthening the position of the FRG in this region is continuing. Is this not indicated, for example, by inclusion in 1980 of the North and the Norwegian Sea within the regular patrol zone of the West German Navy, as well as the recent agreement between the FRG and Norway to standardize submarine construction and arms manufacture?

As usual, U.S. and NATO leaders attempt to conceal their aggressive preparations in this region by the myth about a "Soviet military threat." They are unable, however, to convince many people with this crude lie. The peoples of the nations of the Scandinavian Peninsula remember well that the Soviet Army, at the cost of thousands of lives of Soviet servicemen, liberated Northern Norway and the Danish island of Bornholm from Hitlerite occupation.

Strategic significance of the Scandinavian countries for the United States and NATO. In the estimate of U.S. and NATO leaders, it is determined first and foremost by their geographic position. Located close to socialist nations, they represent a favorable bridgehead for launching attacks against vitally important centers in the Soviet Union and other Warsaw Pact nations. In addition, they also consider the fact that in Northern Norway there is a common border with the USSR (196 kilometers).

The Norwegian Sea, situated in the Northern zone of Europe, is viewed by U.S. and NATO military and political leaders as a principal area of operational deployment of their strike fleet and undersea nuclear missile forces, intended to launch strikes at the western and central oblasts of the Soviet Union.

In the opinion of U.S. and NATO ruling circles, this region is of vast significance for the entire NATO organization. They believe that without this region it would be very difficult to fight a war in the principal theater -- Central Europe -- since the northern flank of this theater would be exposed, and Atlantic lines of communication between North America and Western Europe, along which strategic reserves would be transported from the United States and Canada, would become highly vulnerable to attack by the potential adversary.

Scandinavia's position in Europe is viewed as very advantageous for securing important NATO sea lines of communication leading from the Atlantic to the northern regions of the USSR, and for controlling the egress of the enemy's fleets from the Barents and Baltic seas into the Atlantic. Therefore control of the waters of the Norwegian Sea and blockade of the Baltic straits are considered to be a primary mission. In order to accomplish it, the Norwegian and Danish islands in the North Atlantic have been turned into bases for the ASW barrier lines established there.

U.S. leaders also consider the fact that the shortest air route from the United States to the western areas of the Soviet Union runs precisely across the Scandinavian countries. As is noted in the foreign press, it is proposed that this route be used to deliver U.S. strategic nuclear strikes against the USSR. The purpose of air bases and other U.S. facilities in Iceland and Greenland becomes clear in connection with this.

In spite of the complex geographic conditions of the Northern European theater, NATO leaders nevertheless believe that they permit the deployment and basing of substantial NATO force groupings and conduct of large-scale operations in the air and on the sea by these forces, as well as aggressive military operations on land. On the whole the course of war in this theater, in the opinion of NATO forces command authorities, will depend primarily on securing air supremacy and supremacy in the Norwegian Sea as well.

Stressing the importance of the Scandinavian countries to NATO, British General Walker, commander in chief of NATO forces in the Northern European theater, stated: "It is hard to imagine NATO without Norway and Denmark, if they withdrew from its military organization, as France did." The present commander in chief of NATO forces in this theater, British General (Farrer-Khokley), expressed himself just as categorically on this subject, stating that if a war in Europe is not won on the northern flank, the war will be lost.

Preparation of a bridgehead for U.S. and NATO aggression. In 1949, Denmark, Norway, and Iceland were drawn into the aggressive NATO alliance. In 1951 the NATO Northern European theater was established, which includes Norway, Denmark, West Germany's Schleswig-Holstein, as well as the Baltic straits zone. Iceland, the Norwegian and Danish islands in the North Atlantic fall within the zones of the NATO high commands in the Eastern and Western Atlantic.

The Northern European theater stretches 2200 kilometers -- from Nordkapp (in Northern Norway) in the north to the city of Hamburg (FRG) in the south. The theater ranges in depth from 30 to 500 kilometers, with a total area of 382,700 km^2. It has a population of more than 12 million.

This theater is viewed in NATO primarily as an air-sea theater, from which large-scale air and sea operations would be conducted. In connection with this, primary importance is attached to establishment of air and naval bases in this theater. Large air bases and airfields have been built in Bardufoss, Andenes, Bodø and Banak (Norway), Karup, Alborg, Tirstrup , Skrydstrup, Vandel and Verles (Denmark), Lek, Jagel, Husum, Kiel-Holtenau, Itzehoe, Nordholz and Rendsburg (Schleswig-Holstein, FRG). Underground hangars carved out of the rocks are used to shelter combat equipment at airfields in Norway. In particular, as was reported by the foreign press, they are used in Bodø and Bardufoss. In addition, in recent years there has been considerable construction at airfields of concrete shelters for aircraft. There are plans to expand in the near future four air bases in Denmark designated for receiving U.S. aircraft in case of war, for which 750 million crowns are being allocated.

In order to support the deployment of large naval forces in the theater, NATO command authorities have established there an elaborate network of naval bases and ports, taking measures to enhance their survivability and to beef up ASW and antiamphibious defense. The largest bases are located at Ramsund (at the entrance to the port of Narvik), Harstad, Tromsø, Horten, Trondheim, Bergen, and Kristiansand (Norway), Copenhagen, Frederikshavn and Korsor (Denmark), Kiel, Flensburg, Olpenitz, and Neustadt (Schleswig-Holstein). The naval bases and ports of Northern Norway, Iceland and Greenland are equipped for forward basing of NATO naval forces designated for operations in the Arctic Ocean. The numerous deep-water fjords (Figure 1) [not reproduced] and skerry-dotted waters along the coast of Norway, many of which do not freeze in winter due to the influence of warm Gulf Stream, would be extensively used for warship anchorages. Some fjords are as much as 100-200 kilometers in length and suitable for accommodating large warships and vessels. Underground structures and other shelters have been built at naval bases in Norway. In particular, in (Hakonsvern) shelters for submarines have been constructed in the cleft of a cliff, according to reports in the British press.

NATO leaders are reportedly considering the laying of controlled minefields on the floor of the Baltic straits and deploying in this zone shore batteries of Penguin antiship missiles.

Protected command posts for use in war, equipped with various communications gear, have been constructed in the Northern European theater, as well as posts and control facilities for NATO's NADGE automated air defense system, at which more powerful radars are currently being installed in Norway, as well as radio-navigation system stations. Various electronic reconnaissance stations have been set up in Northern Norway along the border of the Soviet Union and on the Danish island of Bornholm in the Baltic, situated close to the coast of the GDR and PPR, while the Andenes (Norway) and Skrydstrup (Denmark) air bases are being readied for the deployment of AWACS reconnaissance system E-3A aircraft.

Considerable attention is devoted in this theater to the development of a network of highways with high traffic capacity, pipeline and maritime transport, as well as the construction of various military supply and storage depots. In the western part of the Jutland Peninsula (Denmark) for example, as is reported by

the foreign press, approximately 5000 tons of various ammunition and a large quantity of fuel are being stored at NATO depots. In the opinion of NATO command authorities, however, the highway and rail network in Northern and Central Norway does not meet modern demands and fails to provide the requisite troop maneuver capability. The lack of roads is aggravated by the rugged forested mountainous terrain. NATO experts consider the numerous tunnels in Norway (there are more than 750 tunnels with a total length in excess of 200 km), as well as the large bridges and ferry crossings in Denmark to be the weakest and most vulnerable points on the road system in the Northern European theater.

The system of pipelines constructed in these countries provides delivery of fuel to airfields and other military installations. Considerable attention is devoted to development of maritime transport and construction of large, modern ports.

Another important water artery in this theater, in addition to the Baltic straits, is the Kiel Canal, which links the North Sea and the Baltic. It is 98.7 km in length, 104 meters wide, and 11.3 meters in depth.

A large network of storage depots for arms, ammunition, fuels and lubricants has been established in this theater, including for West German and British forces. At the end of 1980 an agreement was reached between the United States and Norway on construction of a large storage depot complex in the central part of Norway, to store the weapons of a U.S. infantry brigade. In addition, pursuant to this agreement, Norway pledges to build storage facilities for a Norwegian brigade in Northern Norway.

The Pentagon is also presently nurturing the idea of placing stocks of arms and ammunition on board ships, which would cruise along the Norwegian coast.

Militarist preparations are being extensively carried out not only in the Northern European theater but also in Iceland and on the Norwegian and Danish islands in the North Atlantic. They are all included within the system of anti-submarine barriers in this part of the Atlantic, including the principal barrier, which runs along the line Greenland-Iceland-Faeroes-Shetland Islands (Great Britain). This barrier is equipped, as is reported in the foreign press, with the SOSUS system, employing highly-sensitive hydrophones linked to land stations.

A NATO air base and naval base has been built in Keflavik, Iceland. This base, at which more than 3000 U.S. military personnel are stationed, is under the control of the Pentagon. It is currently being expanded.

In Thule, in the western part of Greenland, there is a large U.S. air base with a 4500 meter runway, which can accommodate aircraft of any type. Temporary warship anchorages have been established along the coast of this island. U.S. Distant Early Warning System stations are deployed in Greenland and Iceland (Figure 2) [not reproduced]. The Pentagon, as is reported in the foreign press, also intends to utilize for military purposes the Norwegian archipelago of Spitsbergen, particularly the island of West Spitsbergen, although, as we know, this is prohibited by the international Paris Treaty of 1920.

NATO forces in the Northern European theater. Several joint commands and headquarters have been established for the purpose of preparing NATO forces and the Northern European theater to carry out aggressive schemes, as well as for directing operations during war in this theater. The entire responsibility for "organization of the defense of Northern Europe" falls on six countries -- Norway, Denmark, the FRG, Great Britain, the United States, and Canada. The latter three countries designate specific contingents of troops to reinforce the NATO forces permanently stationed in this theater.

NATO joint forces in this theater are headed by a commander in chief (a British general is appointed). He is directly subordinate to the supreme commander of NATO Joint Forces in Europe. Joint Forces Headquarters in the Northern European theater is located in Kolsaas (West of Oslo, Norway). The heaquarters staff consists of representatives of the above-named countries, with the exception of Canada. Recently the FRG representation on this staff was increased on that country's request.

The structure of regional commands in the theater (Figure 3) [not reproduced] was devised taking into consideration the great extent of the theater and difficult communications between separate regions. There are three regional commands subordinate to the high command -- in Northern Norway, Southern Norway, and the Baltic straits zone. Two ground forces commands have been established in the latter, due to the fact that Danish territory is broken up into islands.

Regional commands in Norway are always headed by Norwegian generals, and in the Baltic straits zone, by a Danish general (his deputy is a West German general). Danish and FRG representatives are alternately designated commanding general of joint ground forces on the Jutland Peninsula, in Schleswig-Holstein and on the island of Fuenen, as well as naval forces in the Baltic straits zone.

NATO Joint Forces in the theater include the armed forces of the NATO countries situated within its boundaries. In peacetime only a part of the armed forces of these countries are designated to NATO. The majority of the ground forces, air forces and naval forces combined units and units are designated for transfer to NATO command authorities in case of an emergency situation, and temporarily during the conduct of exercises.

Judging from reports in the foreign press, the armed forces of the NATO countries which are deployed in this theater are basically as follows.

NORWAY: 37,000 men (ground forces 18,000, air forces 10,000, naval forces 9000). They include a motorized infantry brigade and a battalion group (stationed in Northern Norway), 8 air force squadrons and a Nike-Hercules antiaircraft missile battalion. Armament includes 185 Leopard, M48 and M24 (70 of which are light tanks) tanks, 130 M109 155 mm self-propelled howitzers, 115 F-104G and D, F-5A and B, and F-16A combat aircraft, 128 antiaircraft missiles, 15 submarines, 5 guided missile frigates, 40 patrol missile craft and 8 patrol torpedo boats.

DENMARK: 32,600 men (ground forces 19,300, air forces 7600, naval forces 5700). Five motorized infantry brigades, an independent battalion, 6 air force squadrons, and 2 antiaircraft missile battalions (Nike-Hercules and Improved

Hawk). Principal armament: 200 Leopard-1, Centurion, and M41 tanks (approximately 20 of which are light tanks), 72 M109 155 mm self-propelled howitzers, 650 M113 armored personnel carriers, 116 F-35 XD Draken, F-100D/F and F-104G combat aircraft, 60 antiaircraft missile launchers, 6 submarines, 10 frigates (3 guided missile ships), 10 patrol missile craft, and 6 patrol torpedo boats.

FRG (in Schleswig-Holstein): the 6th Motorized Infantry Division, 2 air force squadrons (4 squadrons of G91 and F-4 aircraft), and 2 Improved Hawk antiaircraft missile battalions. These forces have nuclear weapon delivery platforms. FRG naval forces include 24 submarines, 9 destroyers (including 7 guided missile destroyers), 6 frigates, 30 patrol missile craft and 10 torpedo boats.

In organizational development of their armed forces, Norway and Denmark devote considerable attention to maintaining reserve components at a high level of mobilization readiness. As is reported in the foreign press, within the first 24 hours following announcement of mobilization, Norway plans to deploy 11 brigades based on existing training regiments, as well as an 85,000-man "Home Guard" and civil defense (150,000). Within this same time Denmark intends to form an additional 2 brigades, 21 battalions of local defense troops, and to mobilize 72,000 members of the Hjemvaern [Home Guard] and 60,000 civil defense personnel. Within this same time plans in Schleswig-Holstein call for forming a division of combat troops and FRG territorial defense units.

The Norwegian Air Force has purchased 72 new U.S. F-16 fighters (they are becoming operational), and the Danish Air Force has purchased 58 of these fighters. The Norwegian Navy has ordered 10 submarines from the FRG and 14 Hawk missile-armed patrol craft. Six "Bremen" class guided missile frigates and Type-143A missile-armed fast attack craft are being built for the FRG Navy. In connection with unilateral removal of restrictions by the NATO countries to construction of ships in the FRG, the Bundesmarine in the future, in the opinion of foreign experts, will be equipped with even larger warships.

Possessing comparatively small forces deployed over a vast territory, the NATO Joint Forces Command in the Northern European theater is counting on rapid REINFORCEMENT by redeploying troops into this region from other theaters and other NATO countries. An important role in this connection is assigned to the permanent NATO naval force in the Atlantic, which consists of from 5 to 6 destroyers and frigates, belonging to various NATO countries. This force periodically shows its presence off the Norwegian coast, and also enters that country's ports.

NATO also plans to reinforce its northern flank with from 3 to 4 motorized infantry battalions and 3 to 4 air force squadrons from NATO mobile forces in Europe. Judging from exercises such as "Express," which are held most frequently in Northern Norway, but sometimes in Denmark as well, airborne and motorized infantry (infantry) battalions assigned to NATO mobile ground forces by Great Britain, Canada, Luxembourg, and Italy, as well as air force squadrons assigned to NATO mobile air forces by the United States, Great Britain, Belgium, and the Netherlands, would be redeployed to this theater.

The NATO force grouping in the Northern European Theater would also be strengthened by redeploying to this theater additional troops from the United States, Great Britain, and Canada. As is reported in the foreign press, the Pentagon is preparing to land 45,000 Marines on NATO's northern flank, and in particular, a reinforced Marine brigade numbering 8-10 thousand men in Northern Norway. Western military experts believe that U.S. airborne troops can also be redeployed to this theater, as has been done in a number of exercises, in Denmark, for example. In 1976 the Pentagon made an agreement with Denmark to redeploy to that country, in case of aggravation of the situation, four U.S. air force squadrons, including operational F-15 and F-16 aircraft. Ten air bases are reportedly being readied in Norway and four in Denmark for basing the U.S. aircraft. In the opinion of NATO command authorities, reinforcements of up to 3 divisions are required in Denmark.

Great Britain is planning to deploy to Northern Norway a brigade of Royal Marines, which would include a Dutch commando battalion, plus a brigade of ground forces and an air forces special (airborne) regiment to other parts of the theater. The latter has been redeployed to Denmark on several occasions during exercises. Several British air force squadrons will also be redeployed to this theater.

Canada is designating for the Northern European Theater a brigade group, which is provided with everything needed for operations in arctic mountain conditions, and will be deployed to Northern Norway within a two-week period.

As is reported in the Western press, joint forces in the Central European Theater will also take part in military operations in the Baltic straits zone, while as many as 4 or 5 carrier strike groups from NATO's Striking Fleet Atlantic will take part in operations in Norway and the Norwegian Sea (Figure 4) [not reproduced].

The NATO theater command assigns a primary role to maintaining NATO forces at a high level of combat and mobilization readiness, as well as to providing them with new weapons and combat equipment. In order to improve troop field proficiency and to work on their missions in the theater, numerous exercises and maneuvers are conducted, the intensity and scale of which are continuously increasing. In the course of these militarist demonstrations, particular attention is focused on training troops for operating in the difficult arctic conditions of Northern Norway (Figure 5) [not reproduced], where temperatures, which dip to -40°C and lower, can rise suddenly, under the influence of the warm Gulf Stream, producing thaws with wet snow. Difficulties in military operations can be caused by the unaccustomed length of the arctic day and night. NATO command authorities believe that the lack of roads and snowdrifts in Northern Norway will greatly complicate the movements of combined units and units, will diminish their mobility, while the extremely low temperatures will inhibit the actions of personnel and could lead to heavy casualties. Therefore they are taking measures to provide troops designated for operations in that region with special equipment (oversnow vehicles) and insulated but lightweight clothing. In the opinion of NATO command authorities, the most suitable means of transporting troops and supplies in Northern Norway are tracked vehicles, helicopters and coastal vessels, while in many areas off-road

movements are possible only on foot, with sledges employed to haul supplies.

The above information from the foreign press attests to the fact that the U.S. imperialists, together with their NATO partners, having adopted a policy of aggravation of international tension and conducting intensified preparations for another world war, are turning the territories of a number of Scandinavian countries into a bridgehead for an attack on the Soviet Union and other nations of the socialist community. This obliges Soviet servicemen to keep a vigilant eye on the intrigues of the enemies of peace and to be constantly ready, together with the men of the brother armies of the Warsaw Pact nations, to offer a resolute rebuff to the NATO aggressors.

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COMMENTS ON SOCIAL AND POLITICAL PROBLEMS IN U.S. ARMED FORCES

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[Article, published under the heading "General Military Problems," by Col E. Asaturov: "Sociopolitical Problems in the U.S. Armed Forces"]

[Text] The U.S. armed forces constitute the main instrument for carrying out the aggressive course of policy of U.S. ruling circles, which aims at establishing world domination and opposing the progressive processes which are taking place on our planet. In order to ensure that armed forces personnel support Washington's adventuristic policy, in order to raise their morale and fighting spirit and to neutralize the serious sociopolitical consequences of the failure of the U.S. aggression in Indochina, the Pentagon has devised and is aggressively implementing an extensive aggregate of measures, a special place among which is occupied by adoption in 1973 of the principle of acquisition of manpower for the U.S. armed forces exclusively by hire. This step, as is noted in the foreign press, has enabled U.S. military and political leaders to accomplish within a comparatively short period of time virtual neutralization of the influence on personnel of the moral-political crisis called the "Vietnam syndrome" and to stabilize the situation in the armed forces. In the opinion of foreign experts, the fact that in recent years the established enlistment quotas have been met attests to an appreciable dulling of the feeling of alienation from military service in the present generation of American youth, which facilitiates shaping the moral-psychological countenance of military personnel needed for accomplishing the missions assigned to the armed forces of this imperialist power, and makes it possible to ensure their willingness to carry out any and all criminal orders.

At the same time, as foreign experts note, change in the principle of manpower acquisition has led to changes in the qualitative composition of military personnel, has aggravated certain previsously existing and has engendered new problems of a sociopolitical character, to overcome which additional efforts were required on the part of U.S. ruling circles and armed forces command authorities.

The pay and benefits offered to hired soldiers, connected with adoption of the new principle of manpower acquisition, have proven attractive chiefly to young people suffering deprivation and in financial need. The magazine U.S. NEWS AND WORLD REPORT acknowledges that "most frequently recruits are from low-income

and the least-educated segments of U.S. society. They include many poor young Hispanics, poor whites from the South, and poor blacks from the ghettos of the big cities." In the Army, for example, which has been most affected by abolition of the draft, among recruits the number of persons from families with income below the established poverty level increased from 16 to 30 percent in the first year following elimination of the draft, while in that same period recruits from families of above-average income dropped from 17 to 9.6 percent. Thus the burden of military service has fallen primarily on the most disadvantaged young people.

As is indicated by periodic surveys of U.S. military personnel, persons who have become victims of the bourgeois way of life and intensive militarist propaganda are enlisting in the U.S. armed forces with increasing frequency. The majority of these are young people who are unable to continue their education and learn a civilian occupation, who have believed the promises of recruitment advertising. Ninety-five percent of the military personnel surveyed consider material incentive to be of determining importance in military service. The U.S. military press acknowledges that "new recruits almost never mention patriotism."

The clash with military realities in the United States, however, frequently leads to collapse of the notions formed in civilian youth by militarist advertising. Even among those who complete their first term of service according to contract, two out five state that they would not have joined the armed forces if they had "known what this means." By virtue of this, with armed forces manpower acquisition exclusively by hire, desertion (absence from one's unit without leave for more than 30 days) remains typical. The number of deserters is presently twice the number prior to the war in Vietnam. U.S. command authorities, however, presently view this action not as a crime but as a breach of contract. Particularly since according to an analysis conducted by Pentagon experts, the typical potential deserter is a young soldier who has not completed high school, is of limited intellectual ability, and has been a discipline problem in the past, that is, a person who is of no value to the armed forces.

The change in the principle of manpower acquisition led during the first years to a certain equalization in the general educational level of persons enlisting in the armed forces: the number of persons with a higher education became substantially smaller. According to reports in the foreign press, college graduates, who comprised 17 percent of inductees in 1964, comprised only 3.2 percent in 1980. Only 276 of the 339,678 persons recruited into the Army in 1980 had a college diploma, and only 25 of these went into line assignments. The percentage of persons with a secondary education remained almost unchanged, but there was an increase in the number of persons who had completed high school with low grades. There was a substantial increase in the percentage of recruits with an incomplete high-school education (from 28 to 41.4 percent in 1980, although they comprise only 20 percent of boys 18 to 19 years of age for the country as a whole). It is characteristic that primarily persons with a high-school education are taken into the Air Force and Navy (85 and 72 percent respectively in 1981). If one considers the substantial dropout rate during the first year of military service by contract (persons with an incomplete

high-school education are discharged early twice as frequently as those who have graduated from high school), the general educational level of personnel as a whole is higher than that of the new recruits.

Plans to raise the educational level of recruits are being made taking into consideration forecasts that the rate of unemployment among youth will remain unchanged or even rise. In 1981 alone the percentage of high-school graduates among persons enlisting in the army rose from 54 to 71 percent, and from 41 to 70 percent among persons going into line units.

Judging by official figures in the U.S. press, there has taken place a certain averaging of intellectual abilities among volunteer enlistees. Following elimination of the draft, representation of persons in the top two categories of intellectual ability declined from 42 percent in 1964 to 27 percent in 1979, and to 24.3 percent in 1981. At the same time the armed forces contained fewer young men in the lowest category of mental ability. On the average 30 percent of enlistees have test results not above the fourth category, while only 9 percent of persons enlisted into the Air Force are in this category, and only 18 percent in the Navy.

U.S. command authorities are endeavoring to limit as much as possible the influx of the least capable individuals into the military. Even during a period of chronic underrecruitment of volunteers, one out of every four persons desiring to enlist in the armed forces was turned down as a result of low test results. By decision of Congress, strict limits have been established for enlistment of persons in the lowest category of mental ability: 25 percent in fiscal 1982 and 20 percent in 1983.

In recent years there has been a substantial change in the racial composition of military personnel. Originally the overall percentage of Negroes in the armed forces was to be limited to 15 percent, and 19 percent in the Army. In 1980, however, Negroes comprised 22 percent of new recruits, while the percentage was even higher in 1979. In comparison with 1964, the number of Negro officers has more than doubled (reaching 6.8 percent), while the number of enlisted personnel and noncommissioned officers has almost tripled (32.5 percent), and has increased by 4-6-fold in some noncommisioned officer categories. The representation of Negro recruits with a high-school education has increased from 54 to 65 percent. Enlisted personnel in today's U.S. Army represent the only segment of U.S. society where the level of education of Negroes exceeds that of whites. As was reported by the newspaper ARMY TIMES, "the best of the blacks and the worst of the whites are being taken into the all-volunteer Army." The percentage of Negroes in combat units is especially high (up to 50 percent).

U.S. military circles view the increase in the number of Negroes in the armed forces as a certain potential threat to the army's "balance of reliability," since there is occurring a steady increase in the number of those persons whom U.S. ruling circles trust least of all with the mission of defending the interests of capital. One Pentagon report recommended avoiding excessive

concentration of Negroes in line assignments. "The image of the black being killed in a war of whites," the report emphasized, "could give rise to very serious problems."

In spite of a clear-cut trend in the United States to marry at a later age, the number of men with families has become considerably larger in the armed forces, since they receive additional benefits. For this reason sham marriages have become typical, including between men and women who are both serving in the military. The percentage of married persons among the junior categories of enlisted personnel and noncommissioned officers has almost doubled since elimination of the draft, reaching 45 percent. Sixty percent of Army personnel are married.

The number of women in the armed forces has tripled since 1973, totaling 150,000 at the beginning of 1980. Recently there has been a substantial decrease in the number of female enlistees, and enlistment requirements on females have been significantly toughened. Preparations are in progress to reduce the percentage share of women in the Army and Navy.

The change in the principle of manpower acquisition and the resulting maximum stress on the personal advantages and benefits promised by service in the armed forces have influenced not only the social composition of military personnel but also their attitude toward military service and the character of mutual relations among the different categories. A broad range of measures aimed at making a military career attractive to young people included, alongside an appreciable pay increase for the lower categories of military personnel, elimination of certain traditional military procedures and a pretense of "democratization" of life in the military. As reported by the newspaper WASHINGTON STAR, "the skinhead haircut, verbal or physical abuse by drill sergeants, which cause excessive stress, and regulations prohibiting the wearing of moustaches and talking in the mess hall, were eliminated in particular. They have also abandoned the idea that the individuality of the recruit, once he arrives at the training center, must be broken and reshaped anew."

A substantial decrease in the regimenting influence of traditional military ways in combination with other factors have led to a substantial stratification of military collectives and an increase in frictions, in particular between young soldiers who have found a temporary refuge in the armed forces and those noncommissioned officers and specialists who are committed to a long military career. As the U.S. press has acknowledged, "the principle 'privates stick together' has become the main rule in the barracks.... Instead of merging with the general flow of military life, they join into underground brotherhoods and serve out their time, endeavoring to be discharged as soon as possible."

A sociological survey conducted by the Walter Reed Army Research Institute notes that "the most vicious insult a soldier can level at another is the contemptuous term 'lifer.' Many young soldiers consider those who have dedicated themselves to service in the Army, especially sergeants, not to be commanders but buffoons who cannot make it outside the military."

There have appeared admissions in U.S. military newspapers that "the barracks has in fact become a halfway house on the road from and to civilian life. It

is a peculiar way station for youngsters until they find an apartment, a woman, or both, and a refuge for the veterans, when their wives throw them out of the house. The feeling of a unified subunit, living and working together, has disappeared."

Dissatisfaction with the present situation on the part of military professionals, who have been brought up in the traditional concepts of military service, has been manifested in a response reaction -- from total disregard for the needs and aspirations of their fellow soldiers and subordinates to open hostility. The change in barracks life, the tense atmosphere in military units, and awareness of one's own helplessness and superfluousness with this state of affairs have impelled many career military to leave the armed forces. "Good professional sergeants have preferred to leave the military than to deal with soldiers whom they considered difficult to train and to teach discipline, especially after the armed forces limited disciplinary action against persons committing offenses," stated the newspaper ARMY TIMES. As of the beginning of 1980 there was a 74,000-man shortage of noncommissioned officers and specialists of the top categories. There was a shortage of 22,000 noncommissioned officers in the Air Force alone.

This has aroused serious concern on the part of U.S. command authorities since, according to Pentagon figures, 100 military professionals can replace 250 less-trained soldiers, especially in technical jobs, while a combination of 40 percent professionals and 60 percent first-hitch personnel is considered to be the most economical.

Age restrictions for certain ranks were reduced, and the range of persons who can count on receiving a pension and corresponding benefits following 20 years of service was expanded in order to make up for the shortage of noncommissioned officers as rapidly as possible and to increase NCO incentive to serve. With a subsequent pay boost, greater attention was focused on this category of military personnel. As a result of these measures, in 1981 alone the percentage of persons extending their term of enlistment increased from 57.5 to 63.4 percent, and rose to 69.5 percent in the Army. The shortage of NCO's in the Army dropped from 67,000 in 1979 to approximately 3000 in 1981. In the Air Force 86 percent of personnel who had served two or more hitches remained in the service. Figures are somewhat lower in the Navy and Marine Corps. In these services 58.7 and 46 percent of personnel respectively extended their contracts.

Certain difficulties arose with junior officer personnel. As the newspaper WASHINGTON STAR stated, in recent years the percentage share of officers in the total number of Army personnel has declined from 17 to 11 percent, and "it is becoming increasingly more difficult for the army to keep experienced line officers." In 1975 70 percent of young officers in line units agreed to extend their term of service upon completion of their service obligation, while by 1979 only 44 percent were making this decision. The number of officers leaving the Army in their first years of service has doubled during these four years. Even among graduates of prestigious West Point, who are considered the "cream" of the officer corps, the number of officers leaving the military after completing their service obligation increased from 10 percent in 1975 to 25 percent in 1978. The Air Force is 2000 pilots short. In the last 4 years approximately

12,000 pilots and about 5000 navigators have left the Air Force, for many of whom a civilian aviation job seemed more attractive and financially advantageous.

U.S. command authorities believe that the most recent pay increase of 15 percent, an increase in housing allowance for military professionals, and several new innovations in performance of service will make it possible in the near future also to solve the problem of retaining junior officers in the armed forces.

There appear many reports in the U.S. military press that careerism, the striving to advance up the career ladder at any cost, has become incredibly widespread in the officer corps. The impetus for this was the reduction in the size of the officer corps following the defeat of the U.S. military in Indochina. It is now openly acknowledged that for many officers "the sole lodestar is an excessively narrowed gaze 'upward' and a corresponding servile desire on the part of some officers to please their superior. When one company competes with another it is not a joint activity but rather a contest reminiscent of puppies fighting for their mother's milk. The endeavor by a commander to make his company the best is due chiefly to the fact that this will help him advance more rapidly in his career." In these conditions, stated the newspaper ARMY TIMES, "an atmosphere is created in which everybody tries to get the other guy, a philosophy of 'every man for himself,' and there is an increasing feeling of fear, fear of making the slightest mistake.... Colleagues become enemies in the competitive struggle for career advance, and the path is littered with the bodies of those who have failed."

That same newspaper acknowledged that the principal concerns of officers "boil down to how to receive a rank promotion, to retain their authority and to avoid suspicions of incompetence. They do not actually want to know what is going on in the barracks, and they intervene only in serious occurrences -- racial brawls and fights in the barracks...." Such statements are virtually a forced acknowledgement of alienation between officer personnel and enlisted men, who frequently acknowledge that they "are being used as a ladder for somebody's career."

A mercantilistic view of military service and the endeavor to obtain maximum personal benefit from this service constitute favorable soil for the development of conflicts and clashes for the most diversified reasons and grounds. In particular, frictions between married and single personnel have increased, since married personnel, holding the same job and performing the same duties as single persons, receive an additional pay allowance for an apartment and are able to live out of the barracks.

Favoritism by superiors toward female subordinates, who are frequently unfairly promoted or assigned to choice jobs, with male personnel being given the hard jobs, has become a serious problem which has arisen in connection with an increased number of women in the armed forces. This causes friction in mixed units, discord, resentment, and complaints.

Relations between enlisted and noncom males and females of equal rank and position are frequently of a complicated nature, which is a consequence of the sex-object view of women which has been cultivated for decades in the U.S. society and especially in the armed forces. A tense atmosphere prevails in many units. Female military personnel frequently complain that they are forced to take refuge in barracks with barred windows, not against thieves but against the importunities of their fellow soldiers, from whom they see nothing other than an intolerably vulgar attitude toward them.

Continuing discrimination against Negro military personnel and their increasing overall percentage numbers in the armed forces, in combination with widespread racist views, are aggravating their relations with white servicemen, especially in the Navy, where the Ku Klux Klan has appreciably stepped up its activities.

Drug use and drunkenness remain an acute social problem in the U.S. armed forces. Official Defense Department statistics indicate the widespread occurrence of these problems, although a resolute, extensive campaign is being waged against them. Methods of detecting drug addicts are constantly being improved, and the number of personnel engaged in this campaign is increasing. Whoever cannot eliminate bad habits is removed from the armed forces, especially if he is a recent recruit. One out of every four U.S. servicemen in Western Europe receiving an early discharge was a drug or alcohol abuser. Needed and experienced specialists are sent for compulsory treatment. There has also been declared a crusade against alcoholism which, acknowledges the newspaper NEW YORK TIMES, "has for such a long time been tolerated and even encouraged in the military." The U.S. military operates six alcoholic treatment centers just in Western Europe. The Navy operates 100 such centers, which have treated 92,685 persons in the last 10 years.

In order to obtain the quality of personnel needed by the military, to exert pressure on those interested in continuing in the military, and to maintain discipline and morale at the requisite level, the procedure of getting rid of servicemen who are objectionable or undesirable for any reasons has been considerably simplified. Command authorities are empowered to discharge a serviceman "in the interests of the service," "as unfit," "for unworthy conduct," and for other reasons. The so-called "rapid discharge," including "in the interests of the service," is widely practiced, that is, a commander is authorized to rid himself, without taking disciplinary measures, of personnel who in his opinion have a poor attitude toward the service or who are unable to become accustomed to conditions in the military. The extent to which this measure is applied is attested by the fact that on the average one out of every three young soldiers is discharged.

As an effective means of influencing those who have a comparatively conscientious attitude toward military service and who are interested in extending their term of service, command authorities make extensive use of the right to refuse to allow a serviceman to reinlist. Giving the "interests of the service" as a reason, review boards can discharge noncommissioned officers and top-category specialists with many years of service. The traditional dismissal of any serviceman by court-martial sentence has been retained.

Relaxations of demands are gradually being eliminated, and the former ways in the daily life of the U.S. barracks are gradually being restored.

In order to smooth over conflicts between different categories of military personnel, to improve the cohesiveness of units and to reduce to a minimum the moving of personnel, it is being suggested that a person spend his entire term of service in the same unit, regardless of its duration. Toward this same end relieving of military personnel at overseas bases will be done not individually but as units. Such experiments are already being performed.

It is reported that in order to improve certain skills on the part of young recruits, basic training at training centers has been extended to 8 weeks, and the training program has been increased from 308 to 405 hours.

Measures to increase material incentive on the part of all categories of military personnel are being consistently implemented. A new medal and three decorations to be awarded in peacetime have been established to provide moral incentive. This is being supplemented by stepping up political indoctrination (inculcation of ideas), by toughening disciplinary measures, and by increasing requirements on potential enlistees. Considerable efforts are being made to raise the prestige of military service.

The sociopolitical problems enumerated above, as well as many others which have arisen or become aggravated in connection with a shift to an all-volunteer army unquestionably have a corresponding negative effect on the political-morale state and fighting efficiency of U.S. armed forces personnel. But this influence is realized by U.S. military and political leaders, and its consequences are being neutralized to a significant degree by countermeasures, which are improving year by year.

Aggressive implementation by U.S. leaders of the above-discussed measures to improve morale in the all-volunteer Army is ensuring to a significant degree, in the estimate of foreign experts, its reliability as an instrument for carrying out Washington's aggressive policy, which is expressed in demonstration of the readiness of the U.S. armed forces to take part in militarist acts of provocation, in perpetrating aggressive actions abroad, and in increasing the Pentagon's military presence in various parts of the world.

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COMMENTS ON U.S. ARMS SALES TO SAUDI ARABIA

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) page 24

[Article, published under the heading "General Military Problems," by Lt Col Yu. Sedov: "Washington's Dangerous Schemes"]

[Text] The Pentagon has recently stepped up militarist preparations in the Persian Gulf region and the Mediterranean and is speeding up the establishment of gendarme "rapid deployment forces" designated for this region. A decision by Congress at the end of October 1981 to sell Saudi Arabia a large consignment of the most modern arms, costing in excess of 8.5 billion dollars, was another step along the road of implementing aggressive U.S. policy in the Near and Middle East. According to reports in the U.S. military press, this arms sale includes the following types of military equipment:

five E-3A AWACS aircraft. It is also planned to build corresponding ground equipment and to train local operating personnel. This sales deal will be carried out over a period of 3 years, at a cost of 5.8 billion dollars.

1177 AIM-9L Sidewinder air-to-air missiles (the most advanced in this family), at a total of 200 million dollars.

101 sets of Fast Pack combined tank-containers (two in a set), to be used by F-15 fighter-bombers. The tanks can accommodate additional equipment for performing various missions and a 4500 kg fuel load, which will make it possible, according to the calculations of Western experts, to extend the unrefueled range of these aircraft to 5000 km, and to increase their combat capabilities. Delivery is scheduled to be completed by mid-1983. The contract totals 110 million dollars.

8 aerial tankers based on the Boeing 707 aircraft (2.4 billion dollars).

The debate in Congress on this military deal, the largest in U.S. history, took place under conditions where Zionist circles were making every attempt to thwart its approval, believing that U.S. arms in Saudi Arabia would threaten Israel's security. In order to reassure the patrons of the Israeli aggressors,

the Reagan Administration assured them repeatedly of his unswerving adherence to a policy aimed at "maintaining Israel's substantial military superiority over its potential adversaries." This should be expressed in particular in the fact that the United States, to quote Under Secretary of State J. Buckley, "will maintain control of the AWACS system and will not permit the Saudis to conduct surveillance of Israeli aircraft." The Pentagon believes that the complexity of operating and maintaining this equipment will require the presence of U.S. specialists as long as the E-3A aircraft are being used. In addition, Riyadh will receive, reports the magazine AVIATION WEEK AND SPACE TECHNOLOGY, a simplified version of the AWACS system, missing a number of basic pieces of equipment. At the same time Israel was promised large-scale additional military aid, as well as a guarantee of further development of U.S.-Israeli relations within the framework of the September 1981 so-called agreement on "strategic cooperation."

At the same time Washington does not conceal the fact that the above-mentioned deal is aimed chiefly at building up the U.S. military presence in that region, strengthening control over the oil produced there, and turning Saudi Arabia into a base for the interventionist "rapid deployment forces." According to reports in the foreign press, the Pentagon is counting on obtaining access to information which will be obtained with the aid of the AWACS system, while the aerial tankers can be utilized to provide midair refueling for U.S. aircraft based on carriers in the Indian Ocean and the Mediterranean. As J. Buckley stated this deal will make it possible to establish in Saudi Arabia appropriate stores of arms, to build runways meeting the requirements of the U.S. Air Force, and to install modern ground equipment, while "the technicians who are today operating the AWACS system will be able to handle with equal success the aircraft of the rapid deployment forces." According to the terms of the agreement, an additional 800 U.S. military advisers will be sent to Saudi Arabia.

By sending additional arms to Riyadh, the United States seeks to strengthen relations with the largest oil producer in the capitalist world, to make it an accomplice in U.S. aggressive plans in the region, and to involve Saudi Arabia in the stalled Camp David process, counting on creating conditions for involving other Arab countries in it. Endeavoring to substantiate the "importance" of this agreement for the monarchic regime and concealing its true intentions, the White House seeks to frighten it with an imaginary "Communist threat" allegedly proceeding from the Soviet Union and a number of neighboring countries, particularly "from revolutionary Iran, radical Iraq, and Marxist South Yemen." Proceeding from this contrived "danger," but in actual fact pursuing patently aggressive aims, it is also the United States which has primarily selected the areas where AWACS aircraft will be based in Saudi Arabia. According to the magazine U.S. NEWS AND WORLD REPORT, they will be located at air bases at Turayf (northern region), Dhahran (eastern) and Khamis-Mushayt (southern).

The new U.S.-Saudi deal is in fact viewed by the United States as an opportunity to establish another U.S. bridgehead in the Near and Middle East. Such dangerous schemes, behind which stand Washington's imperial ambitions and adventurism, constitute a serious threat to the security of the peoples living in this region.

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COMMENTS ON MATHEMATICAL MODELING OF U.S. GROUND FORCES OPERATIONS

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[Article, published under the heading "Ground Forces," by Candidate of Military Sciences Engr-Col D. Sokolov: "Mathematical Models of U.S. Ground Forces Theater Operations"; passages rendered in all capital letters printed in boldface in source]

[Text] U.S. Army command authorities, constantly seeking ways to increase the combat capabilities of combined units and units for the purpose of implementing the aggressive schemes of U.S. imperialism, determining the requisite structure of the ground forces and volume of logistic support, and also predicting the anticipated results of combat operations, extensively employ mathematical modeling which, in combination with field testing (exercises), is considered to be a highly effective instrument of military research, making it possible to achieve savings in financial resources.

According to reports in the foreign military press, in recent years scientific research organizations of the U.S. Department of Defense and the U.S. Army have devised a large number of models of theater ground forces operations, the principal ones of which are examined in this article, retaining the special terminology encountered in the publications of foreign authors.[1]

As is noted in the foreign press, one of the earliest models of theater ground forces operations is the COMBAT-2 MODEL, which was devised at the end of the 1960's. It is intended for investigation of the requisite theater combat force level and corresponding supplies primarily in conditions of combat with the employment of nuclear weapons. Selected as operation success evaluation criterion in this model is movement of the battle line, figured from the ratio of relative casualties and losses of the opposing forces. This is a large-scale (synthesized) model. For example, the company is adopted as the lower level of detailing ground forces, and a generalized type of aircraft for tactical air operating in their interests. Air defense and fire support weapons (antiaircraft guns, field artillery and mortars, etc) are conditionally distributed among companies.

Ground forces in this model are presented in the form of three generalized fronts,[2] which for practical purposes represent areas of operations of army

corps or field armies (army groups). One of them is the main front, while the other two are secondary. Organization of the forces of a front and its structure are not specified in the model, and it is not tied to actual terrain. In addition, each opposing side has a rear area, which combines the rear areas of army corps and the theater communications zone. Reserves and supply depots are deployed in it. The current numerical strength of the forces of a front is determined in this model by the formula

$$B^{CB} = B_0^{CB} + \Delta B_p^{CB} - \sum_{i=1}^{5} \Delta B_i^{CB},$$

where B_0^{CB} -- initial number of companies in the front;

ΔB_p^{CB} -- number of companies coming into the front from the reserve;

ΔB_1^{CB} -- number of companies taken out of action by hostile fire;

ΔB_2^{CB} -- number of companies taken out of action by nuclear artillery;

ΔB_3^{CB} -- number of companies taken out of action by tactical missiles with nuclear warheads (if available to the force);

ΔB_4^{CB} -- number of companies taken out of action by operational-tactical missiles with nuclear warheads;

ΔB_5^{CB} -- number of companies taken out of action by tactical air.

Losses from each of the above-enumerated enemy weapon categories are determined as

$$\Delta B_i^{CB} = P_i \cdot R_i \cdot K_{i1} \cdot K_{i2} \cdot \ldots \cdot K_{in},$$

where P_i -- effectiveness of weapons of type i, expressed by the number of companies taken out of action; R_i -- number of weapons of type i; K_{i1}, $K_{i2} \ldots$, K_{in} -- coefficients figuring in certain factors influencing the effectiveness of combat operations (weather, terrain, target detection capabilities, etc).

For the main front displacement of the line of contact between the opposing forces is calculated with the formula

$$r_{\text{гл}} = \frac{B_0^{CB} \cdot \delta R_0^{CB} - R_0^{CB} \cdot \delta B_0^{CB}}{B_0^{CB} \cdot \delta R_0^{CB} + R_0^{CB} \cdot \delta B_0^{CB}} \cdot r_{max},$$

where B_0^{CB}, R_0^{CB} -- initial strength of the opposing sides;

δR_0^{CB}, δB_0^{CB} -- casualties and losses of the opposing sides;

r_{max} -- maximum allowable troop advance.

For the secondary fronts, displacement of the line of contact is as follows:

$$r_{\text{всп}} = K \cdot r_{\text{гл}},$$

where $K < 1$ -- predetermined coefficient.

Tactical air is described by one generalized type of aircraft, the current number of which is determined with the formula

$$B^{TA} = B_0^{TA} - \sum_{i=1}^{4} \Delta B_i^{TA}.$$

where B_0^{ta} -- initial number of tactical aircraft;

ΔB_1^{ta} -- losses to fighter-interceptors;

ΔB_2^{ta} -- losses to hostile antiaircraft missiles and artillery;

ΔB_3^{ta} -- losses as a result of operational-tactical missile strikes on airfields;

ΔB_4^{ta} -- losses from airstrikes on airfield.

The actions of command, control, and combat support systems are not modeled. Distribution of manpower and equipment among missions is performed by the model users.[3]

Experience in using the Combat-2 model indicated that it enables one to determine the influence trends of various factors which are figured in the model on the course of combat operations and to estimate only the general level of casualties and losses without a detailed prediction of the course of the entire operation. As is noted by foreign experts, a sufficient clarity of structure is an advantage of this model, which makes it easier for the investigator to interpret the obtained results. By means of a simplified description of processes of combat operations and a high level of combining, the authors succeeded in achieving a rather high-speed model. For example, the average computer solution time for 10 days of combat operations is only 2 minutes. Formalization and computer entry of input data are performed with equally relative simplicity. Preparation of more or less satisfactory synthesized indices, however, such as combat efficiency, loss and casualty correction factors, etc, requires substantial preliminary labor outlays by highly-skilled specialists, while the obtained values are of a highly approximate character.

At almost that same time U.S. experts devised a series of model with the aid of which it became possible to predict the course of combat operations at the "battalion-division," and "division-theater force" level. One of these models was the ATHENA (another designation was CEM), which is a typical class of models utilizing firepower indexes to predict the results of combat operations. It was widely used in the United States in the 1960's. The model describes theater combat operations without the employment of nuclear weapons and only with a continuous battle line. An extensive set of decision-making programs at the "division-theater force" level was formulated in this model. The model has a high degree of aggregation: for ground forces detailing goes only to the brigade level, and for air forces -- to a generalized aircraft type. The duration of the predicted operation may run several months.

Ground forces are described in the model by number of brigades, divisions, corps, and armies operating in the theater. Divisions and corps arbitrarily occupy combat operations sectors,[4] the terrain in which is subdivided into four types, determined by synthesized topography and trafficability characteristics. The structure of troops proper is also formalized, that is, affiliation of brigades to divisions, divisions to corps, etc is specified. The combat capabilities of combined units and large strategic formations are expressed by summary combat capabilities indexes, which are a sum of the firepower indexes of arms and combat equipment types,[5] multiplied by situation coefficients, which are determined by the terrain and character of combat operations. The summary index consists of the indexes of six weapon categories (tanks, armored

personnel carriers, field artillery and mortars, small arms, man-portable anti-tank missiles, and helicopters). Their effectiveness against targets of three generalized types (tanks, light armored vehicles, personnel) has been calculated in advance. Therefore the combat operations of brigades and divisions lead to a quite specific level of casualties and losses, which is rigidly bound to the summary indexes of these units.

In calculating the summary indexes of the opposing sides, one also considers their supply of ammunition, fuels and lubricants, a shortage of which, in comparison with standard figures, lowers the level of the summary index. Displacement of the battle line is determined by current ratios of summary indexes of combat capabilities. This relationship is figured in advance and fed into the model in the form of input data. Other input data include standard characteristics of repair and rehabilitation of damaged equipment and recovery of wounded.

Tactical air contained in the theater force is represented in the model by three generalized aircraft types: fighter-interceptors, tactical fighters, and fighter escorts. The first engage air targets over friendly territory, the second, performing generalized missions (neutralization of enemy aircraft on the ground, close air support of ground troops, as well as sealing off the battlefield and reconnaissance), destroy ground targets on enemy territory, while the third destroy air targets beyond the battle line.

Allocation of tactical air among missions and sectors is performed on a theater scale and is expressed by number of sorties. A specific number of sorties is allocated to the division for each day for close air support, and to the army for sealing off the battlefield. Linked to the latter indicator is the degree of delay in replenishment of reserves and equipment by enemy higher echelons, which terminates upon reaching a certain predetermined number of sorties.

The process of combat operations command and control is formalized in the form of sets of rules of decision-making at the "theater force-division" level. At the theater level a decision is made every four days, whereby tactical air is allocated among missions, while aircraft performing the close air support mission, artillery and missile battalions, reserve units and combined units are allocated by armies. Return to action by repaired equipment and recovered wounded is performed taking into account current casualties and losses.

Decisions are made once every two days at the army level. Combat operations sector is determined for each corps, and type of combat action is specified (offensive, delaying actions, etc), proceeding from the ratio of summary combat capabilities indexes of the opposing forces in the given sector. Reserves, supporting weapons, tactical fighters for close air support of ground troops and repaired combat vehicles are allocated, and personnel replacements are performed.

At the corps level decisions are made daily (the type and sector of combat operations are determined for each division, as well as reserves, replacements, supporting weapons and tactical fighter sorties), and every 12 hours in the divisions (all the corps decisions are repeated).

At all command and control echelons, during decision-making a formalized estimate of the degree of force battleworthiness is made, in the course of which one calculates losses and casualties, advance (or retreat), and remaining supplies of ammunition, fuels and lubricants.

As is reported in the foreign military press, the authors of this model assumed that with its assistance one would be able to predict the course of operations and to study the influence of the combat force level of theater forces and the principles of its combat employment on the outcome of combat operations. In the mid-1970's, however, a number of leading U.S. experts sharply criticized not only the arms and combat equipment firepower indexes proper and the force combat potential based on them, but also the mathematical models based on them. They were of the opinion that employment of these indexes introduced significant distortions into the results of forecasting the outcome of specific operations.

Subsequent studies were conducted taking into account existing experience in constructing models for predicting combat operations at various ground forces echelons. This led to the appearance of a new generation of theater ground forces operations models, in the development of which active part was taken by the Institute of Defense Analyses (IDA). It devised the IDAGAM-1 model (IDA Ground-Air Defense), which is a further development of the ATLAS, GACAM and GACAM-2 series of models. In this model the authors refrained from using in explicit form weapons firepower indexes and detailed the process of ground forces combat operations to an even greater extent.

According to the new methodology, a number of sectors are designated from the entire theater (up to 10 for each side), adjacent to the battle line (correspond to combat operations areas). Any number of troops may be deployed in any of these, but not less than a division. There would further be designated two or three reserve areas (these correspond to the location of army corps rear areas) which, as is specified by the simulation program, although not taking part in combat operations, can take casualties from enemy airstrikes. There may also be two generalized air bases in each area. The next element is the theater communications zone (corresponds to the army group reserve areas), in which troops take no casualties. One generalized air base would be located here.

The ground forces of the opposing sides can have up to four types of divisions, described by T/O and actual strength, combat effectiveness (depending on actual strength level), and capabilities to move across the terrain, as well as a certain specified force level at which a division loses its battleworthiness. Division strength in men and arms may not exceed T/O strength. Since friendly and hostile forces may use up to 10 types of weapons, including air defense weapons, the authors of the model generalize weapons in order to fit into the specified restriction. In addition, minefields of various extent and density, as well as other indicators are figured in the model.

The authors specify that tactical air as an element of the theater force may consist of seven types of "Blue" aircraft and three of "Orange." Each of them is described in the model by number of aircraft, effectiveness of performance

of various missions, combat intensity, operational range, and availability of aircraft shelters at air bases. It is assumed that aircraft can provide close support of ground troops, that is, can inflict casualties and losses on enemy combined units and units in the combat operations area and in the rear areas, and can perform missions of destroying enemy air targets and aircraft on the ground. Allocation of aircraft among air bases and missions is specified in the input data for the simulation, while sortie planning is performed within the model proper, taking into account whether aircraft of each type have the effective range to reach the various combat operations areas and rear areas.

Allocation of reserves and supply resources can be specified both in the input data and can be calculated in the process of simulation, although in the latter case the model user should specify the parameters of distribution. IDAGAM-1 makes it possible automatically to effect withdrawal from combat operations areas of combined units and units which have lost their battleworthiness into rear areas or the theater communications zone and to replace them with battleworthy units.

Operation simulation is accomplished in cycles, the duration of which will run from 24 hours to 2-3 days. The model user may also specify arrival of reserves in the theater in the form of independent combined units or number of tactical aircraft of each type, which should correspond to those prescribed for the first day of the operation. Casualties and losses of combat equipment by individual types, displacement of the battle line, and the magnitude of captured (abandoned) territory constitute forecasting results at each stage of combat operations.

The authors of the model believe that minor adjustments will make it possible in the future substantially to increase the number of combat operation parameters which are taken into account, and in particular to model in greater detail the processes of logistic support, reestablishment of the battleworthiness of combined units, redeployment of units and combined units from one combat operations area to another, etc. The authors would also formalize certain decision-making elements at each stage, which at the present time are specified in the form of initial input data.

The VECTOR series of models is a further development of the new generation of theater ground forces operations models. This series, in the opinion of leading foreign researchers, is the most up-to-date, which enables one to describe in a fair amount of detail the process of theater ground forces combat operations. Four different versions of this model have been developed up to the present time: Vector-0 (developed in 1972 and designed to demonstrate the possibility of devising a theater operations model without using weapons firepower indexes), Vector-1 (the first operating version was tested in 1974), Vector-2 (an improved version, with expanded capabilities of description of command, control, communications and reconnaissance, with certain computation modules modified), Vector-3 (adopted in 1977, made it possible to predict casualties and losses of the opposing sides during the conduct of such combat operations as breakthrough of the defense, encirclement, flank attack, etc). U.S. experts note that Vector-3 is a first attempt to reflect more or less correctly in a mathematical model diversified modes of ground forces combat operations.

According to reports in the foreign press, work is presently in progress on a Vector-4 model which, in contrast to previous models, will have the capability of simulating the employment of tactical and operational-tactical nuclear weapons in ground forces combat operations.

The authors of the above-listed models refrained from aggregating weapons and modes of warfare, as well as from employing weapons and combat equipment firepower indexes. They all take into consideration actual weapon performance characteristics, such as projectile dispersion, technical reliability of weapons, effectiveness of projectiles on the target, etc. Their principal use is calculation of data for comparing estimates of the combat capabilities of opposing sides (quantitative-qualitative relative strength) and combat operation forecasting.

Basic Performance Characteristics of Theater Operations Models

Designation of Model	Client and Principal User	Developed by (Scientific Research Institutes and Organizations)	Performance Characteristics of Models			
			Required Computer Memory, Kilobytes	Time to Prepare Input Data, Man-Months	Computer Solution Time, Minutes Per Operation Day	Solution Results Analysis Time, Day
Combat-2	Defense Nuclear Agency	BDM Corp	100	0.1	0.2	1
ATHENA (CEM)	U.S. Army studies and analysis staff	General Research Corp	150	18	20	60
IDAGAM-1	Joint Chiefs of Staff Committee	Institute of Defense Analysis	55-116	•	0.4-2	•
Lulejian-1	Command and Control Technical Center	Lulejian and Associates Incorporated	50	4	0.25-0.6	•
Vector	U.S. Army studies and analysis staff	Vector Research Incorporated	50	6	0.2-0.25	Depending on type of mission

In the opinion of foreign military experts, of all existing models of this series, the Vector-1 has the greatest practical application for predicting the course and outcome of combat operations. It consists of modules which describe the force levels of the opposing sides, disposition of forces on the terrain, characteristics of the latter, as well as the dynamics of combat operations. The entire theater is arbitrarily divided into sectors (up to 10 for each side), where army corps are deployed. The sectors in turn are subdivided into segments,[6] in which so-called maneuver (infantry, motorized infantry, and tank) battalions are disposed. Rear areas are designated in all sectors, in which reserves and stores of supplies are positioned. Sector frontage is determined by the number of maneuver battalions on the battle line (each can occupy an area

of terrain from 2 to 8 km in width), while sector depth is the depth of the theater.

The nature of the terrain is described by 25 categories of characteristics (five categories of visibility and five which determine rate of troop movement on the terrain without considering effect of hostile fire). Ground forces are conditionally subdivided into attack groups (a battalion with support weapons) on the front line, reserve battalions, field artillery, fire support helicopters, and air defense weapons. Battalions contain up to 9 weapon systems, field artillery and fire support helicopters have one type of weapon each, air defense systems -- 2, and tactical air includes up to 7 types of aircraft. Supply is modeled by determining volume of ammunition transported, including landmines, quantity of delivered weapons and combat equipment, fuels and lubricants, etc. This model provides the possibility of destruction of a portion of supplies in the course of combat operations. The requisite quantity of ammunition is determined taking into account the actual rate of fire of ground forces weapon systems and the number of tactical air sorties. Calculation of replacement of arms and combat equipment from the rear areas is performed on the basis of combat losses.

The plans and objectives of the opposing sides are formalized by a certain set of standard solutions. They can either be selected by the model user or be determined automatically on the basis of a prescribed algorithm. The term plan includes some generalized descriptions of the behavior of the opposing sides in the course of combat operations (shift to the attack, conduct of defense and delaying actions, disengagement, etc). In the general case it can be concretized (for example, in the attack advance not more than 10 km). Objectives are formulated at the level of each sector and constitute plan detailing.

Direct modeling of combat operations is represented by fire effect and battle line displacement modules. Battalions on the battle line can attack (the adversary defends), advance (adversary fights delaying actions), pursue (adversary disengages) and be in a state of relative inaction. Field artillery can participate in counterbattery action, offensive preliminary bombardment and counterpreparation, can provide close support to battalions on the battle line and can suppress enemy reserves. Artillery is allocated among these missions by the tactical decisions module. Tactical air performs missions of close support of battalions on the battle line, the air superiority mission (strikes on airfields, air defense suppression, engagement of air targets), suppression of field artillery and isolating the combat operations area (destruction of approaching reserves and supplies being transported to the battle line).

Battle line displacement is simulated in two versions. In the first version 12 standard rates of advance are specified, which depend on type of battalion, terrain characteristics, casualties and losses of friendly and enemy forces. One rate of advance is selected for each segment, depending on plan, objectives, and developing situation at any stage in the simulation process. In the second version decision-making is modeled for each sector, and current rate of advance (retreat) of battalions on the battle line, which forms battle line displacement, is determined on the basis of a preselected list of situation indicators.

Allocation of field artillery, fire support helicopters and tactical air by missions and targets, as well as distribution of battalions and material resources by sectors are performed by the tactical decisions module. This same module determines required troop replacements from reserves and the character of battalion actions on the battle line.

The standard form of representation of simulation results includes the following data: general strength level of the opposing forces, as well as personnel and combat equipment in reserve, daily and summary casualties and arms losses by types (for the theater as a whole), consumption of supplies by supply types, total quantity of combat-ready weapons and combat equipment, number of combat-fit personnel on the battle line and in the rear areas, and number of sorties flown, by aircraft types and missions performed. In addition to general data, the following can be determined for each battalion conducting combat actions on the battle line: numerical strength and force level, location of the line of contact, character of combat operations, number of killed, wounded (by categories), and arms losses (by types).

In the estimate of foreign military experts, the Vector-1 model can provide additional data at the user's request, but this leads to a substantial increase in computer solution time.

As is reported in the foreign military press, in subsequent models of this series U.S. experts succeeded in expanding the capabilities of obtaining more detailed data by further detailing the process of modeling theater ground forces combat operations. In particular, they succeeded in putting into Vector-2 a detailed description of the troop control structure down to the battalion level. The control module also makes it possible to take into account the actions of reconnaissance and target detection means. In addition, the weapons and combat equipment array was expanded. Battalions on the battle line can include 12 types of weapons in place of 9, as well as air defense means and fire support helicopters. Field artillery variety was expanded to 4 types, and air defense weapons to 6. Methods of calculating the fire effect of surface-to-surface and air-to-air weapons were also improved.

Foreign experts note that the program volume of each models of the Vector series exceeds 50,000 words. Solution time runs 2-3 seconds for each day of combat operations for each battalion with supporting weapons. Model solution time can range from 3 to 20 minutes, depending on the composition of the theater ground forces grouping. In the opinion of the authors and users, simulation results are not only of practical significance but also constitute a very flexible instrument for estimating the influence of weapons performance characteristics, troop organization and tactics of conduct of combat operations on the results of theater operations.

Another representative of the new generation of models is the LULEJIAN-1, which became operational in 1977. It is similar to the Vector series models and does not use weapon and combat equipment firepower indexes. It is distinguished chiefly by more detailed modeling of reconnaissance and a somewhat larger larger number of weapon types in comparison with the Vector-2. On the other hand, it takes into less detailed consideration the character of the terrain and

in a very generalized manner the processes of logistic support and distribution of resources and reserves.

The above models are widely used by various organizations of the U.S. Army and the Joint Chiefs of Staff Committee (see table). For example, frequency of utilization of the ATHENA (CEM) model is 25 times a year, and that of the IDAGAM-1 -- 150-200. Models of the Vector series have been widely used since 1977, which U.S. experts consider to be the most promising. It is believed that in the near future they will supplant Combat-2 and ATHENA. Their only shortcoming, judging by reports in the foreign press, is excessive detailing of certain aspects of the process of combat operations, which makes preparation and entry of input data difficult.

Viewing mathematical models as a highly effective means of military research, top U.S. Defense Department officials nevertheless are far from absolutizing simulation results. They believe that for final decision-making on organization for and conduct of a given type of engagement, it is not enough merely to have a quantitative estimate of the actions of the opposing sides but that it is necessary to consider in addition a number of nonformalized factors (the politico-military situation, the morale-psychological state of personnel, etc).

FOOTNOTES

1. For more detail on the development of mathematical modeling of combat operations in the U.S. Army, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 8, 1980, pp 27-34 -- Ed.

2. In this model the term "front" is defined as a force grouping ranging from several divisions to an army group -- Ed.

3. Model users are research and planning agencies in the interests of which a given model is employed -- Ed.

4. The term combat operations sector is defined as an area of terrain within which offense is conducted or defense is organized -- Ed.

5. The term "arms and combat equipment," as defined by U.S. military experts, means the following: "arms" -- man-carried weapons and weapons mounted on combat vehicles; "combat equipment" -- the aggregate of weapons, vehicles and their equipment -- Ed.

6. The term "segment" is defined as a section of terrain in which is disposed a subunit combat formation for conduct of offense or organization of defense -- Ed.

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COMMENTS ON PERSHING II INTERMEDIATE RANGE BALLISTIC MISSILE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 38-42

[Article, published under the heading "Ground Forces," by Engr-Col R. Ignat'yev: "U.S. Pershing II Medium Range Ballistic Missile"]

[Text] In spite of widespread protests by the world community, the NATO bloc has ratified a previously adopted decision which threatened the cause of peace and international détente. Under crude pressure applied by Washington, at a NATO Council meeting in Rome 1981 the member nations gave their consent to implementation of plans to manufacture and deploy new U.S. intermediate range nuclear missile systems on the territory of a number of Western European countries. A NATO Council communiqué states that 108 launchers with Pershing II ballistic missiles and 464 land-based cruise missiles, carrying nuclear warheads, will deployed on the European continent. It has been decided to deploy the Pershing II missiles in the FRG and target them at installations located on the territory of the Soviet Union and other Warsaw Pact countries.

Militant NATO leaders are attempting to claim that this decision is not a new military program but a "modernization" of existing weapons of NATO nuclear forces and forward-based U.S. weapons. In actual fact, however, deployment of qualitatively new nuclear missile weapon systems in Western Europe is leading to disturbance of the established balance of forces and thus to a change of the entire military-strategic situation in Europe. A TASS statement in response to this states that U.S. and NATO officials "come right out and state, without hiding behind a screen of words, that they consider as the main result of the NATO meeting confirmation of the NATO decision to deploy the new U.S. intermediate range ballistic missile in Western Europe."

Judging from materials in the foreign press, the Pershing II intermediate range ballistic missile is a fundamentally new system, not an updated version of the existing Pershing I, as is being claimed in the West. It carries a new nuclear warhead, guidance system, and two solid-propellant motors. The latter increase maximum range by almost 2.5-fold over the Pershing I. It is now approximately 1800 km* with a launch weight of 7200 kg, a length of 10 m and a body diameter of 1 m.

* 2500 km according to other information in the Western press -- Ed.

The missile (Figure 1) [not reproduced] consists of a nose cone, second and first powered stages. The nose cone (length 4.2 m, weight 1362 kg) consists of three sections: radar, warhead, and instrumentation.

The first section contains a radar with stabilized antenna and correlator, nose fairing explosive release mechanism, nose cone power supply, and contact-type detonation sensor. The second section contains a monoblock nuclear warhead (yield to 20 kt; airburst or ground burst) or nuclear penetrating warhead (underground). The latter would be employed to attack strongly-protected targets. Its body is made of an extremely high-strength steel to withstand high impact loads when striking the ground at a speed of more than 610 m/s. It was reported in the foreign press that during tests the body of an experimental warhead, during impact and penetration to a great depth into the ground, displayed fairly high resistance to deformation, sustaining insignificant surface damage.

The principal components of the instrumentation section are the inertial guidance system and a computer, in the memory of which is stored a reference image of the target area in digital form. In addition, it contains the aerodynamic control surface drives, a system of attitude thruster nozzles to control warhead yaw and pitch, a gas generator, power supply, turbopump, electronics air cooling system, warhead separation system, plus other equipment.

The first and second stage motors burn solid rocket fuel based on polybutadiene with terminal hydroxyl groups. The bodies of these stages are fabricated of composite materials. During first-stage engine operation, flight trajectory control is accomplished with the aid of a swiveling nozzle and four air vanes on the skirt, two of which are fixed. Yaw and pitch control (following first-stage separation) is accomplished with the aid of the swiveling nozzle of the second-stage motor, while roll-axis control is accomplished with the nose cone aerodynamic control surfaces. The powered segment of flight ends when the second-stage motor shuts down. The nose cone separates from the second stage and proceeds in a ballistic trajectory.

The missile is mounted on a launcher, the principal components of which are a Ford M757 truck tractor and a semitrailer. A power supply unit, hydraulic system, jacks for launch position leveling, electronic transfer unit, and other equipment are mounted on the launcher (total weight, not including missile, more than 10 tons). The power supply system includes a 30 kilowatt, 50/60 Hz alternator mounted on the truck tractor frame, directly behind the cab, and two DC generators (100 and 200 amps respectively), mounted on the semitrailer. Due to the considerable weight of the Pershing II missile, the Pershing I missile launcher has undergone considerable modification. For example, the semitrailer chassis has been replaced with a heavier one, capable of taking a load up to 16 tons. In addition, the hydraulic system and jacks are higher-output, and an additional DC generator was added to power the launcher and missile systems. The rig can haul the launcher and missile at a speed of 60 km/h, and has a range of about 500 kilometers.

The Pershing II system includes a launcher platoon command post and three launchers with missiles. The systems will be organized into battalions, which are designated for reinforcing field armies and are considered an important means of delivering strikes for the benefit of ground forces. A battalion

contains a total of 36 launchers (4 batteries of 9 launchers each) and 938 men. The command post is contained in an enclosed van (on a truck chassis) and contains all the requisite test and launch equipment. It is connected to the launchers by cables. Communications gear includes an SB-22A switchboard and an AN/TRC-144 radio with antennas and encrypting equipment. The command post team consists of the platoon commander, sergeant, three launch operators (one per missile) and a radio operator. The operator mans a remote launch control console connected to the missile and launcher. In front of him is a printer, which prints out information on missile readiness and on operations being performed.

Following deployment to launch position, the missile is raised on the launcher to vertical position and readied for firing. The operator obtains the geographic coordinates of the targets to be hit, as well as a reference image of the target area recorded on tape. Simultaneously the operator feeds the coordinates of the target and launch point manually into the missile, as well as the firing azimuth (missiles are brought to bearing with the aid of a gyrostabilized platform). Several minutes from the moment the alarm is received are required to ready a missile for firing at a preplanned target.

If necessary, a missile can be retargeted to an unpreplanned target. For this, the requisite information on the area of the new target is transmitted by special communication channels from the U.S. Department of Defense cartography office to a computer at the battery command post. A reference image of the target area is created in this computer, which is recorded in digital form onto magnetic tape and transmitted to the launcher platoon command post and from there into the missile on-board computer memory.

After a launch command and confirmation signal have been received (by NATO communications system channels), operations are performed to remove the interlock from the warhead nuclear charge device, the launch button is pushed, and the missile is fired. The flight trajectory of a Pershing II (Figure 2) [not reproduced] is divided into three phases: the initial (powered), the middle and terminal (self-guidance). The first phase begins after the missile leaves the launcher and terminates at the moment of warhead separation from the second stage. The greater part of the middle phase of the flight trajectory takes place above the atmosphere, at an altitude of approximately 300 km, during which nose cone velocity is Mach 12. At the beginning of this phase, the nose cone orients itself in the direction of the target for subsequent reentry and to reduce to a minimum effective radar-reflecting surface, in order to reduce the possibility of radar acquisition. In this phase nose cone yaw and pitch control is accomplished by the attitude thrusters (it is above the atmosphere), while the aerodynamic control surfaces take over following reentry.

The middle phase terminates following nose cone reentry and jettisoning of the protective radar fairing. The radar and correlator are switched on by computer command, and the self-guidance phase begins. The radar antenna circular-scans the terrain ahead at a rate of 2 rps. The reflected radar signal is converted in the receiver to a continuous video signal, which is represented in digital form in the processor -- in the form of binary digits used to shape the current radar image of the terrain in the target area.

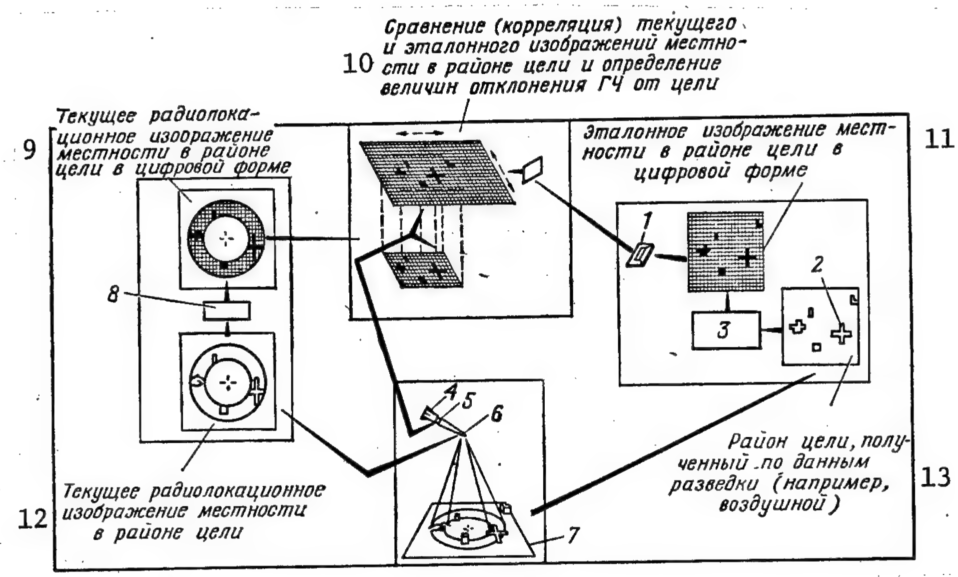

Figure 3. Operating Principle of Pershing II Missile Radar-Mapping Guidance System

Key:

1. Cassette with reference image of target area
2. Target (airfield)
3. Ground equipment for converting target area intelligence into digital form
4. Correcting signal applied to aerodynamic control surfaces
5. Correlation computer
6. Missile nose cone
7. Target area
8. Digital processor
9. Current radar image of terrain in target area in digital form
10. Comparison (correlation) of current and reference terrain image in target area and determination of amount of nose cone deviation from target
11. Reference image of terrain in target area in digital form
12. Current radar image of terrain in target area
13. Target area obtained by reconnaissance data (air, for example)

The operating principle of the RADAG (Radar Area Guidance) terrain radar-mapping system in the terminal phase of the trajectory (Figure 3) is based on comparing the current radar image of the terrain in the target area with the reference image stored in the computer. The latter is also represented in digital form -- in the form of binary digits. As a result of correlation (comparison) of the two images, the magnitudes (errors) of nose cone deviations from the target are determined; after processing in the computer, these deviation amounts are applied to the measuring unit of the inertial guidance system to adjust the nose cone trajectory. Comparison is performed several times at various altitudes as the nose cone approaches the target area. Thus the nose cone flight trajectory is being corrected virtually to impact on the target.

The guidance system was initially flight-tested on helicopters, and subsequently on a piloted aircraft which dove at simulated targets. At the end of the 1970's five actual launchings of Pershing II missiles were performed at the White Sands range, launchings which, it is noted in the foreign press, indicated a rather high accuracy of the system, superior in principal parameters to other guidance systems. For example, circular error probable on the fifth launch was within 25 meters.

The missile is presently in full-scale development, with more than 20 test launches planned. Approximately 200 million dollars has been appropriated for fiscal 1982 for continuing the development program and for building an initial number of Pershing II missiles. The U.S. Department of Defense is planning to commence deployment of the first launchers and missiles in Western Europe in 1983.

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COMMENTS ON SMALL ARMS DEVELOPMENTS IN NATO, ELSEWHERE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 42-48

[Article, published under the heading "Ground Forces," by V. Shipilov: "Small Arms of the Armies of Capitalist Countries"]

[Text] In spite of the appearance of nuclear and other modern weaponry in the arsenals of the leading capitalist countries, the ground forces command authorities of these countries believe that even today small arms maintain their importance as the personal and crew-served weapons employed in the largest numbers. Their principal advantages, in the opinion of foreign experts, are their light weight and small size, with relatively large firepower, capable of killing personnel and inflicting damage on other lightly-protected targets, as well as establishing continuous defensive fire at close ranges. Heavy machineguns can also engage low-flying aircraft and certain ground targets with light armor protection. The armies of capitalist countries are presently armed with pistols, submachineguns, carbines, rifles, as well as light, general purpose, medium, and heavy machineguns.

In 1953 the NATO countries standardized small arms ammunition for the first time. The U.S. T65 7.62 mm cartridge was adopted for rifles and machineguns, a round which was designated the 7.62 mm NATO cartridge or the 7.62 x 51 mm cartridge. It weighs 25.1 grams (bullet weight 9.3 grams), it is 71.7 mm in length (case 51 mm), and has a muzzle velocity of 840 m/s.

A 9 mm cartridge was selected for pistols and submachineguns, designated the 9 mm parabellum or 9 x 19 mm cartriedge. It weighs 12.3 grams (bullet weight 8 grams), is 29.7 mm in length (case 19 mm), and has a muzzle velocity of 396 m/s.

As a result of these measures, the majority of weapons developed at the end of the 1950's and beginning of the 1960's were of the standard calibers. At the same time the armies of a number of capitalist countries have small arms of other calibers as well: 11.43 mm pistols and submachineguns (United States), 8 mm general purpose machineguns (Sweden), 7.92 mm rifles (Spain, Turkey), 7.5 mm rifles and machineguns (France), and 6.5 mm rifles and light machineguns (Sweden).

In the opinion of foreign military experts, an important stage in the development of small arms abroad was the development and adoption in 1963 by the U.S. Army of the M16A1 5.56 mm rifle with full-auto capability. It is smaller, lighter, and has less recoil than the 7.62 mm rifle, and also groups better on full-automatic fire. Tests conducted by the Italian firm of Beretta on a 5.56 mm cartridge for its rifle showed that at ranges out to 400 meters its bullet possessed greater lethal effect (than the 7.62 mm) as a consequence of the fact that it has less kinetic energy and loses stability on encountering an obstacle (figures 1 and 2) [not reproduced]. Striking a human body, this bullet creates serious, lacerated wounds. It is noted that a decrease in the weight of rifle and ammunition (the 5.56 mm cartridge weighs 11.6 grams, and the bullet -- 3.56 grams) enables an infantryman, carrying the same weight, to double or triple the number of rounds carried.

The fairly good combat performance characteristics and serviceability of the M16A1 rifle shown in the war in Vietnam, foreign experts believe, was the reason for many countries showing an interest in developing a rifle in a caliber smaller than 7.62 mm. As a result of this, a number of countries have developed 5.56 mm assault rifles and machineguns: the West German HK33A1 rifle, the British Sterling, the French MAS, the Austrian StG77, the Belgian CAL and FNC (the latter is a modified version of the former), the Minimi machinegun, the Italian Beretta rifle and machinegun, and the Israeli Galil assault rifle. Other than the U.S. Army, however, domestically developed weapons of this caliber have been adopted only by the French, Israeli, and Austrian armies. Several countries manufacture weapons of this caliber for sale to countries in the Near and Middle East, Asia and Latin America.

At the present time the development of small arms abroad is proceeding in the following basic directions: reducing size and weight, improving ruggedness and serviceability, development of caseless ammunition, increasing firepower and density of fire, increasing accuracy and grouping, increasing the lethality of rounds, and decreasing the variety of models used.

The problem of reducing weight and size is being solved both by moving to a caliber smaller than 7.62 mm (which makes it possible to decrease weapon weight by more than 1 kg) and by developing models operating on the "bullpup" principle: moving the action into the forward part of the buttstock (the French MAS rifle and the Austrian StG77). In addition, various lightweight materials are used in weapon construction. For example, the buttstock, forestock, and handguard are made of plastic.

In the opinion of West German experts, the life of rifle barrels can be extended by using new high-strength materials and adopting polygonal barrels (the bore section is a regular polygon), which will make it possible , in their opinion, to extend barrel life approximately 20 percent. Particularly intensive efforts in this area were conducted in the mid-1970's.

The FRG is presently developing weapons which use caseless ammunition. In particular, the G11 rifle has been developed. A design feature of this rifle is the fact that it employs the principle of stored momentum (the action moves to extreme rear position after completion of a three-round burst).

It was reported in the foreign press that the West German experts encountered a number of technical difficulties in designing the G11 rifle: cooking off of the propellant charge when the barrel was heated, ensuring mechanical strength of the propellant charge and stability of its characteristics during storage, obtaining a good chamber seal, and extraction following a misfire. At the end of 1980 spokesmen for the firms Heckler & Koch and Dynamit Nobel announced that they succeeded in correcting these problems. This rifle is tentatively scheduled for comprehensive field testing in 1984, after which the decision will be made on whether it will be adopted by the Bundeswehr. The problem of increasing firepower and density of fire is being resolved by foreign experts by developing and adopting ammunition with several lethal elements, which are fired by a single propellant charge.

An increase in accuracy of fire and grouping is achieved by several ways: first of all, by moving to a smaller caliber, which lessens recoil (the muzzle energy of a 5.56 mm bullet is 1780 J, while that of 7.62 mm bullet is 3242 J), and secondly, by developing weapons incorporating the stored momentum principle.

Japanese experts, in order to reduce recoil and increase the accuracy of the 7.62 mm Type 64 rifle, employed a cartridge with a reduced propellant charge. In addition, in order to increase accuracy during single-round fire, a number of rifles have been equipped with scopes.

The task of increasing effectiveness of rounds on the target is accomplished by reducing the margin of stability of bullets when striking an obstruction (which helps cause more serious wounds), by employing armor-piercing cores of depleted uranium, as well as antipersonnel grenades containing ready lethal elements. In the 1960's the United States was working on development of a special-purpose personal weapon, the Spew, firing dartlike lethal elements, which cause large, lacerated wounds on impact with a human body. In 1973, however, development efforts were terminated because of difficulties in getting the arrow-shaped projectile to remain stable in flight.

Alongside common directions of development, each type of small arm has its own inherent design and technical features, caused both by the views of its designers and by the capabilities of the given country. Table 1 [not reproduced] contains the specifications and performance data on regular-issue and several experimental models of small arms of capitalist countries.

Pistols (Figure 3) [not reproduced] are issued as personal weapon to officers and noncommissioned officers, as well as enlisted personnel of certain branches of service. All pistols employed by the armies of capitalist countries are autoloading. The majority were designed for the standard 9 mm parabellum cartridge. Their action is based on the principle of short-stroke barrel recoil or blowback. Pistols weigh from 0.8 to 1.2 kg, have an aimed-fire range of 50-60 m, a rate of fire of 14-40 rounds per minute, and a magazine capacity of 7-13 rounds.

Future improvement of this type of small arm, in the opinion of foreign military experts, will proceed in the direction of weight reduction, increased reliability and operational safety. At the same time they believe that pistols

are a peacetime weapon, while in time of war personnel should be issued submachineguns or rifles.

Submachineguns (Figure 4) [not reproduced] are issued to airborne troops and crews of fighting vehicles and heavy weapons.

Most submachineguns fire the standard 9 mm parabellum round. They operate on the blowback principle or are gas-operated. In order to reduce the weight and size of these weapons the majority of models come with a folding (extending) metal stock. It is noted in the foreign press that relatively light weight (3-4 kg), relatively high rate of fire (to 100-130 rounds per minute in burst fire) and effectiveness against personnel at ranges up to 200 meters are characteristic of weapons of this type. They use a banana or straight box type magazine holding 20-40 rounds.

In the opinion of foreign experts, the Israeli Uzi 9 mm submachinegun is of an interesting design; the bolt telescopes the barrel (to two thirds of its length) in order to reduce the length of the receiver and consequently of the entire weapon.

Studies conducted abroad indicate that improvement of small arms of this type will proceed in the direction of greater convenience and safety of operation in conditions of restricted space (by development and use of spent case and empty magazine ejection mechanisms) and by reducing weight (by employing light, high-strength materials and alloys). At the present time a number of capitalist countries are developing 5.56 mm submachineguns based on assualt rifles of this caliber; the principal feature of these weapons is a shortened barrel.

With the aim of improving accuracy of fire, the United States has developed a new 5.56 mm submachinegun, the AM180, featuring a laser sight. It is gas-operated. The submachinegun, together with a magazine containing 177 rounds and laser sight, weighs 5.74 kg, is 918 mm in length, has a rate of fire of 1500 rounds per minute, and a barrel length of 406 mm.

Rifles (see color plate insert) are the most widespread type of personal weapon issued to subunit personnel in the armies of capitalist countries. All of them, with the exception of sniper rifles, are automatic or semiautomatic. They are gas-operated or semi-blowback. They are semi, auto, and burst-fire (three-round burst) selective. In order to improve burst-fire accuracy, a number of rifles are equipped with bipods. In addition, the majority of models are adapted for firing rifle grenades with blank cartridges.

The most common are rifles firing the 7.62 mm NATO cartridge, as well as the U.S. 5.56 mm M16A1. They weigh from 3.5 to 5 kg, length 990-1100 mm, aimed fire range 400-600 m, actual rate of fire on full auto 100-200 rounds per minute, with ammunition fed from a 20-40 round magazine. In the opinion of foreign experts, there will continue in the future the trend toward a caliber reduction to 4-6 mm, which will make it possible, in particular, to reduce rifle weight and size.

In 1976 the NATO member nations signed an agreement calling for small arms tests and selection of a second standard caliber for rifles and a light machinegun. As a result of analysis of various small arms ammunition performed by the members of the NATO committee of permanent representatives on weapons, it was decided to standardize a light-recoil cartridge smaller than 7.62 mm.

In order to choose a small-caliber catridge, a NATO program was conducted for combined testing of weapons and ammunition, a program which began in 1977. The investigation process was divided into two phases: technical testing, and field testing. The former constituted preliminary studies of weapons and ammunition in order to determine the degree to which they had been developed and possibilities of using them in field tests. The purpose of the latter was to determine the performance characteristics of weapons and ammunition in the process of actual field use, in conformity with the stated performance requirements.

As was noted in the foreign press, the principal tasks of the field tests were the following: determination of probability of hitting and destroying the target, as well as the time required to ready the weapon for for firing; study of weapon reliability, convenience and simplicity of handling and operation, safety of operation, and conditions of care and maintenance; determination of the possibility of using a weapon for training purposes. At the same time it was stressed that NATO requirements on the weapons being tested sometimes fail to coincide with the requirements of individual countries. For example, the rifle and machinegun ranges required by the United States were much greater than those proposed by the European countries.

Foreign experts encountered a number of difficulties in conducting a comparative analysis of cartridges. In particular, not one of the submitted rifle models is adapted for firing all cartridges being tested, which excludes the possibility of an adequately full evaluation. Table 2 [not reproduced] contains basic characteristics of these cartridges, as well as test results.

At the end of 1980 the decision was made to standardize within NATO the Belgian SS109 5.56 mm cartridge. It is noted thereby that the bullet of this cartridge has greater penetrating ability than that of the U.S. XM777 5.56 mm cartridge, but is inferior to the latter in lethal effect.

In the opinion of foreign experts, the combined tests of small arms and ammunition by the NATO countries can serve as a basis for studying other military equipment with the aim of standardization within NATO.

It is reported that work will continue in the area of improving accuracy and grouping capability, and the development of multipurpose weapons capable of engaging individual and group targets at ranges up to 400 m (the first such model is an M16A1 rifle with an M203 40 mm grenade launcher mounted under the barrel).

Machineguns (see color plate insert) -- these are subunit crew-served automatic weapons. The armies of the capitalist countries have light, general purpose, medium and heavy machineguns, most of which fire the 7.62 mm cartridge, as well

as 12.7 mm heavy-caliber machineguns, designed for engaging low-flying aircraft and lightly armored ground targets. The latter are mounted primarily on tanks, infantry fighting vehicles and armored personnel carriers.

General purpose machineguns, which are lighter versions of medium or heavy machineguns, are the most widely employed in the armies of the NATO countries. They can be employed both with a light tripod and a bipod. General purpose machineguns, together with tripod, weigh 17-25 kg, have an actual rate of fire of 200-250 rounds per minute, and a range of aimed fire of 600-800 meters from a bipod and 1100-2200 meters from a tripod mount. Further improvement of this category of small arms will proceed in the direction of reducing weight, increasing firepower, improving accuracy, reliability, ease and safety of operation.

Versions of assault rifles with heavier barrels are frequently employed as infantry squad light machineguns. Alongside advantages (light weight with a high rate of fire), light machineguns have a number of drawbacks. One of the main drawbacks, in the opinion of foreign experts, is the small magazine capacity.

Recently a number of countries have developed 5.56 mm light machineguns, of which the Belgian Minimi is considered the best (it is gas-operated). As a result of comprehensive testing and refinement of this machinegun, spokesmen for the Belgian firm FN have stated, a multipurpose weapon was developed, which is superior in performance characteristics to some large-caliber models. This machinegun can be fired from the hip (arms), from a bipod and from a tripod mount.

Foreign military experts consider one of the advantages of the Minimi machinegun to be its simplicity and reliability of operation, as well as the fact that it has three ammunition-feeding systems: disintegrating link belt, semi-transparent magazine with a 200-round belt, and a 30-round sector-type magazine, also used with the FNC rifle. In addition, it also features a quick-change barrel. In September 1980 the Minimi machinegun was taken by U.S. experts for refinement before making the final decision on employing it as an infantry support weapon. The question of round to be employed will also be considered: the Belgian SS109 or the U.S. XM777.

On the whole, as is reported in the Western press, NATO military leaders are planning to have in the combat units in the 1980's only standard small arms, which will be of two calibers: the NATO 7.62 mm cartridge for heavy and general purpose machineguns; a standard round (probably 5.56 mm) for submachineguns, assault rifles, and light machineguns.

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COMMENTS ON CONTROL OF U.S. STRATEGIC AIR COMMAND FORCES

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[Article, published under the heading "Air Forces," by Candidate of Technical Sciences Engr-Lt Col V. Tamanskiy: "Control of U.S. Air Force SAC Forces"; passages rendered in all capital letters printed in boldface in source]

[Text] Continuing a further buildup of military potential and pursuing thereby the aim of achieving military superiority over the USSR and the other nations of the socialist community, U.S. aggressive circles are attaching great importance in the process of military preparations to increasing the combat power of their strategic offensive forces, including intercontinental ballistic missile (ICBM) units, combined units, and formations, strategic aviation, and nuclear-powered missile-armed submarines (SSBN). The first two components of this "triad" are components of the Strategic Air Command (SAC) of the U.S. Air Force. According to figures published in the Western press, it contains the following: 26 ICBM squadrons, 9 of which are armed with Minuteman II ICBMs (450 launchers), 11 with Minuteman III (550 launchers) and 6 with Titan II (53 launchers); 65 air squadrons (totaling approximately 1000 aircraft), including 21 squadrons of B-52 heavy bombers (347 bombers), and 5 squadrons of FB-111A medium bombers (65), plus 33 KC-135A aerial tankers (487). All these subunits are organized into wings and divisions, which in turn are elements of two air forces (the 8th and 15th).

Proceeding from the importance of the missions assigned SAC forces, U.S. military leaders devote considerable attention to further increasing their striking power and combat readiness.

U.S. military experts consider development and improvement of the command and control system to be one of the main areas of increasing their combat readiness. They explain that combat operations in present-day conditions will be characterized by a highly dynamic state, rapid situation change, and little time for decision-making, and therefore the delivery platforms and weapons proper will be unable to accomplish their assigned missions without an appropriate command and control system.

As is noted in the U.S. press, the U.S. Air Force SAC bears the main responsibility for readying ICBMs and strategic bombers for combat and controlling their combat operations. Therefore the commander in chief of SAC, with

the assistance of his staff and subordinate command and control agencies, organizes and executes the entire aggregate of measures involved in accomplishing these missions.

The U.S. Air Force SAC command and control system is an important component part of the global system of operational control of that country's armed forces. It includes control agencies, controlled entities, and communications facilities providing transmission of commands, instructions and other information necessary for the effective functioning of all system elements.

Combat employment of strategic offensive forces is at the decision of the U.S. President, which is communicated to the Joint Chiefs of Staff (JCS) -- the country's supreme armed forces command and control authority. The JCS, from their principal command center (located underground at the Pentagon) or from an alternate command center (located in the foothills of the Blue Ridge Mountains, 90-95 km from Washington) or from an airborne command post, on the basis of the President's decision and general operational plan of employment of the armed forces, gives the command to the U.S. Air Force SAC for combat employment of ICBMs and strategic bombers.

Following are the principal command and control entities of the Strategic Air Command: main, alternate, and airborne command posts, command posts of air forces, missile and air wings, squadrons, as well as underground ICBM launch control centers. Depending on functional duties, they are provided with appropriate 465L automated command and control system equipment, and communications equipment.

The SAC control center (Figure 1) [not reproduced], as is reported in the foreign press, is located below ground in the SAC headquarters building at Offutt Air Force Base, Nebraska. It has a self-contained life-support system and operates around the clock. All information received at the command center is processed with the aid of the 465L automated command and control system, which determines and evaluates the state of combat readiness of ICBMs and strategic bombers, plans logistic support, and transmits information and operational orders to subordinate combined units, units, and subunits.

The SAC airborne command post is carried on special EC-135 aircraft (Figure 2) [not reproduced], which are based at Offutt Air Force Base and sequentially (one at a time) fly around-the-clock airborne alert, with a command group on board. In peacetime it is headed by a duty general officer.

Air Force command posts have been organized at the headquarters of the 8th and 15th air forces. They are set up in underground structures at Barksdale Air Force Base, Louisiana, and March Air Force Base (California) respectively. Either of them can be used as an alternate SAC command center.

Command posts of units and subunits are located at 30 SAC air bases. A total of 153 underground launch control centers have been established for direct control of ICBM launches, 100 for Minuteman ICBMs (one launch control center for 10 silos) and 53 for Titan II ICBMs (one for each launcher).

Alongside sequential movement of commands, a capability is provided for the direct transmission of a command from the JSC main command center to launch control centers. Strategic bomber combat control commands are communicated to the squadron and further to individual aircraft (as the U.S. press notes, there is a capability to transmit commands during a bomber's entire flight to the target).

The following were considered the basic principles in establishing and further developing the U.S. Air Force SAC command and control system: a high degree of efficiency, stability, reliability, flexibility, and security of command and control.

A high degree of EFFICIENCY OF COMMAND AND CONTROL will make it possible, in the opinion of Air Force command authorities, to perform command and control tasks more rapidly, which is particularly important when making the decision to conduct combat operations and communicating it to executing agencies. In connection with the fact that the decision to employ strategic offensive forces is made by the U.S. President, improving efficiency of command and control involves measures affecting not only the SAC command and control system but also higher agencies -- the U.S. President and the Joint Chiefs of Staff. U.S. military leaders consider the principal direction in ensuring a high degree of efficiency of command and control to be the extensive employment of automated control systems, which have been deployed both for the JSC and the SAC and are operating within the framework of the global armed forces command and control system.

As is noted in the Western press, the Strategic Air Command operates the 465L automated control system, which includes three subsystems -- data gathering and processing, display and transmission. Equipment of the first subsystem is installed at SAC command posts. It is based on H 6080 electronic computers, which gather and process current information coming in from lower-echelon control entities, the nuclear missile attack warning system, and from the Air Force meteorological center. Data display subsystem equipment is installed at SAC and Air Force command centers. It displays information on the disposition and status of missiles and strategic bombers for command authorities and command or control center officers. The data transmission subsystem provides prompt communication of directive documents, orders and instructions from the SAC command center and below, down to ICBM launch control centers.

Using means of automation, in the opinion of U.S. military experts, is not an end in itself, but is for the purpose of improving control efficiency. And a primary role is assigned not to machines but to men, who have the final say in decisions pertaining to employment of subordinate forces. In particular, the deputy under secretary of defense for C^3 resources and intelligence resources stated that data processing, transmission and display equipment merely provides the various officials with information needed for them to make decisions.

According to materials published in the U.S. press, U.S. military leaders are devoting serious attention to increasing STABILITY OF COMMAND AND CONTROL of SAC forces, that is, the capability of SAC command authorities to perform their functions in a complex and rapidly changing situation. It is believed that the principal way to increase stability of command and control is to attain a high

degree of survivability, operational reliability and jamming resistance of command centers and control facilities. Proceeding from this, the U.S. armed forces have established and are continuously improving an elaborate system of command centers. In the view of U.S. military experts, however, existing underground JSC and SAC command centers, since the development of high-accuracy nuclear missile weapons, have ceased to meet the requirements of survivability and are viewed by them as installations which may be knocked out of operation on the outbreak of a nuclear missile war. In connection with this, an entire complex of airborne command posts was established for command and control of ICBMs and bombers.

As is attested by the foreign press, the airborne command post system for command and control of SAC forces includes JSC and SAC airborne command posts, regional alternate SAC airborne command posts (eastern and western zones), communications relay aircraft, and airborne Minuteman ICBM launch control centers. This system includes a total of approximately 30 EC-135, E-4A and B aircraft, nine of which are sequentially assigned to around-the-clock ground alert (JSC airborne command post) and airborne alert (SAC airborne command post) status. The equipment carried by the EC-135 aircraft has been repeatedly updated, as a result of which the airborne command centers on board these aircraft have acquired the capability to utilize the Afsatcom satellite communications system. They have been provided with additional cryptographic equipment in order to make command and control more secure. In addition, the EC-135 carries automated data processing equipment (based on the AN/UVK-47 small computer) which, in the view of U.S. experts, will enable the airborne command post team more effectively to control subordinate forces.

In addition, the United States has developed a new airborne command post on the 481L program, based on the wide-bodied Boeing 747 (its first version is designated the E-4a). Its greater load capacity and working space makes it possible, it is emphasized in the Western press, to accommodate a large quantity of control equipment, and when necessary to increase the number of command post personnel. Old communications equipment removed from EC-135 aircraft, however, is used on the E-4A airborne command post. The latest version of this airborne command post, with new C^3 equipment, is designated the E-4B (see color plate insert) [not reproduced].

It is planned to upgrade, beginning in 1982, the three remaining E-4A airborne command posts to E-4Bs (one aircraft each year) and to purchase an additional two aircraft of the latter type. U.S. military leaders plan to have six E-4B aircraft by 1985 (three of these will be used as JSC airborne command posts and three as airborne command posts for the SAC commander in chief). The new airborne command post is provided with: modern data processing and display equipment; an extensive array of communications equipment, including satellite, which should ensure a high degree of communications reliability in all conditions; more sophisticated Minuteman ICBM launch control equipment, with the aid of which it is possible to receive data from ICBM launch locations on their status, receipt of commands, to retarget missiles, etc.

Accomplishment of the tasks assigned to the airborne command posts pertaining to ICBM and strategic bomber command and control will be assured through employment of the equipment enumerated above. As is noted in the U.S. press,

if an emergency situation develops, all these aircraft will take to the air, and the crews on board (command groups) would ensure transmission of appropriate commands from the airborne command post of the SAC commander in chief to the ICBM launch control centers and strategic bomber aircrews.

In the opinion of U.S. leaders, a high degree of RELIABILITY OF COMMAND AND CONTROL is achieved by performing organizational and technical measures. The former include the following: establishment of structure and formulation of methods of stage-by-stage and direct communication of commands pertaining to combat employment of weapons; strict regulation of authorities, procedure and plans of their combat employment; organization of continuous alert duty at command centers and ICBM launch control centers; highest priority to transmission of tactical control commands. Technical measures specify the following: utilization of modern data processing and display equipment, landline and radio communications gear operating in various radio frequency bands -- from ELF to the centimeter band; equipment redundancy; employment of the latest advances in radio electronics in designing and building command and control equipment; utilization, alongside traditional means, of nontraditional means of transmitting tactical control commands.

An example of the latter is a special backup system for transmitting JSC and SAC commander in chief operational orders to all command and control entities, down to ICBM launch control centers as well as strategic bombers on the ground and in the air in emergency conditions with the aid of Minuteman II missiles. In place of a nuclear warhead, they carry special equipment designed for transmitting prerecorded orders and instructions on 10 fixed UHF frequencies.

Another backup communications system for command and control of SAC forces is the 487L. It is intended for tranmitting commands in case of disruption of HF, VHF and UHF communications links as a result of interference by high-altitude nuclear bursts. It operates in the LF and ELF bands. The system contains four high-power receiving and transmitting centers. One of them is located on the Pacific Coast (Barstow, California), a second is located in the middle part of the country (Grand Island, Nebraska), a third on the Atlantic Coast (Norfolk, Virginia), and a fourth on the island of Puerto Rico. By means of this system the command in chief of SAC can transmit operational orders via the above-mentioned receiving and transmitting centers to all subordinate combined units, units, and subunits (their command posts are equipped with 487L system receiving stations).

Ground transmitting facilities for communications in the LF and ELF bands have complex and cumbersome antenna systems. Antenna tower heights reach 300 meters and more, and therefore, U.S. experts believe, they can be easily knocked out of commission as a result of nuclear bursts. In this connection U.S. armed forces command authorities are devoting serious attention to adding to certain aircraft of the airborne command post system transmitters in the LF and ELF bands, that is, establishing airborne communications centers. These aircraft are equipped with reeled trailing antennas up to 8 km in length and high-powered radio transmitters (up to 200 kw).

According to information in the foreign press, work to improve the jamming resistance of command and control systems is being done in the United States within the framework of general measures determined by requirements pertaining to their capability to function in conditions of heavy hostile electronic countermeasures.

As regards the problem of increasing FLEXIBILITY OF CONTROL, U.S. military leaders are endeavoring first and foremost to make fullest utilization of the capabilities of the strategic offensive forces command and control system to adapt to a change in situation and missions. Serious attention is focused on achieving smooth unity and succession of the command and control structure for operating in conditions of peacetime, a period of increasing tension, and during the conduct of war.

U.S. experts define the term SECURITY OF COMMAND AND CONTROL as a guarantee that measures or actions planned by command authorities will not be disclosed to the enemy. Proceeding from this, SAC is carrying out a number of special measures, both of an organizational and technical nature, and in particular: rigorous monitoring of the operation of technical means of information transmission; observance of the established procedure, operating conditions and rules of radio communication; extensive employment of equipment for denying access to telephone and telegraph communications channels.

In the opinion of U.S. military leaders, the operational effectiveness of the strategic offensive forces command and control system and their combat employment depends to a substantial degree on the functioning of the nuclear missile attack warning system, as well as the quality of navigation and meteorological support.

As is noted in the U.S. press, detection of land-based ballistic missile launchings is accomplished with the aid of the IMEWS (Intercontinental Missile Early Warning System) satellite system, the BMEWS (Ballistic Missile Early Warning System) system of ground radar facilities, deployed in Alaska (Clear), Greenland (Thule), and Great Britain (Fylingdales Moor), as well as by means of a radar with a 4600 km range (after upgrading), formerly part of the Safeguard antimissile defense system. Two radars (the Pave Paws system) have been sited on the West and East coasts of the United States to detect sea-launched ballistic missiles. Warning signals are transmitted, directly or via the NORAD command post, to the top U.S. military and political leadership and to SAC.

In the view of U.S. armed forces command authorities, a warning system should ensure promptness in making the decision to employ SAC forces and to communicate the decision to appropriate command and control facilities. Therefore the highest priority is assigned to warning signals, alongside ICBM and strategic bomber combat control commands. At the same time, judging by materials in the foreign press, the U.S. warning system contains a serious defect: the occurrence of spurious signals indicating a nuclear missile attack. Such signals place U.S. strategic offensive forces at the highest state of alert and place the world on the brink of thermonuclear war. In particular, such incidents occurred in November 1979 and twice in June 1980.

The Western press reports that U.S. leaders are continuing to devote considerable attention to further development of strategic offensive forces, assigning them a principal role in plans to achieve their aggressive militarist aspirations.

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COMMENTS ON NATO AIR CAPABILITIES AGAINST GROUND AIR DEFENSES

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[Article, published under the heading "Air Forces," by Docent and Candidate of Military Sciences Col V. Tarabanov and Candidate of Military Sciences Col Yu. Kartenichev: "Combat Between Air and Ground Air Defense Forces"]

[Text] Continuing active preparations for war against the Soviet Union and the other nations of the socialist community, military leaders of the aggressive imperialist NATO bloc are carrying out an extensive program of further buildup and qualitative improvement of their armed forces. In addition to measures directed toward increasing the combat power of NATO air forces, ground air defense forces and facilities are experiencing continuous development. An important role is assigned to both these components in accomplishing the task of gaining air supremacy -- one of the main factors ensuring success in the conduct of combat operations both in individual sectors and in the European theater as a whole.

The rapid advance of air power, as well as its increasing influence on the course and outcome of operations in continental and ocean (sea) theaters have evoked intensive qualitative improvement in air defense weaponry and profound changes in the organizational structure of air defense combined units, units, and subunits, and methods of their employment and control.

It is noted in the foreign press that now, when air defense has become the backbone of defense and one of the principal elements in the order of battle, and air has become a most important component of the combat power of theater forces, the contest between them has reached an unparalleled degree of acuteness. In the opinion of NATO theorists, the results of this contest determine on the one hand the combat stability of any force grouping, and on the other hand the possibility of achieving tactical and strategic objectives in today's combined-arms engagement, battle, and operation.

The approach to the problem of the contest between aircraft and air defense ground forces varies among NATO military experts. Some believe that in the face of today's aerospace threat, all air defense becomes useless and does not justify the resources expended on it. Others overrate the capabilities of anti-aircraft weapons, and especially their psychological effect on the aircrews of fixed-wing combat aircraft and helicopters.

The majority of foreign experts, however, consider both views extreme. They view modern air defense as a powerful force capable of preventing to a significant degree the damage which can be inflicted on defended forces by enemy aircraft and of significantly influencing the results of their operations. At the same time, in their opinion, aircraft, when properly employed, will be able to accomplish their assigned missions.

Studying the problem of the contest between aircraft and ground air defense forces, Western military theorists carefully examine the experience of past wars, the state and development of weaponry, and the modes of their combat employment.

For example, according to information published in the U.S. press, during the war in Korea the U.S. Air Force lost 1000 aircraft just in 1950-1951, including 676 which were downed by antiaircraft artillery. Between 4 August 1964 and 29 October 1969, 919 U.S. aircraft were downed over the Democratic Republic of Vietnam, with 90 percent of these downed by ground air defense weapons. During the war in the Near East (1973), 80 percent of the 120 downed Israeli aircraft were brought down by ground antiaircraft weapons.

On the basis of the above and certain other data, foreign experts have reached the following conclusion: "The destruction of fear-inspiring antiaircraft missiles is at the present time an essential condition for gaining air supremacy."

In order to reduce aircraft losses to antiaircraft missile fire, U.S. military aviation has adopted a number of measures, both technical and tactical. The latter include, in particular, extensive employment of low and extremely low altitudes, especially as aircraft approach their targets. As a result of this the number of aircraft downed by missiles has decreased, but there has been a sharp increase in losses to antiaircraft artillery. For example, according to reports in the foreign press, from 24 July 1965 through February 1967, 31 aircraft were downed by antiaircraft missiles over North Vietnam, while 450 were downed by antiaircraft artillery fire, that is, almost 15 times as many.

In spite of the fact that absolute values of aircraft losses to ground air defense weapons are in many instances quite substantial, they do not always, Western experts believe, accurately reflect the process of the contest between these forces. In particular, in their opinion the question of expenditure of air defense assets per downed aircraft and of the end result, that is, the magnitude of preventable damage which can be sustained by defended forces, remains unanswered. Proceeding from this, a number of foreign authors attempt to make a more detailed analysis of the results of the contest between air defense and aircraft. We cite below some examples examined by them and the conclusions they reached.

At the beginning of World War I, when aircraft speed barely reached 200 km/h, it was necessary to expend 11,585 antiaircraft shells to down one aircraft. by war's end, as a result of technical improvement of antiaircraft weapons, improvement of air defense organization and increased antiaircraft gunner skill, only approximately 5000 shells were required.

Considerably more sophisticated antiaircraft systems were employed in World War II, but this did not reduce the expenditure of rounds per downed aircraft. In 1939-1941, for example, the figure was 6800 shells, in 1942 -- 3343 large-caliber shells and 4941 medium and small-caliber shells, that is, approximately 8300. In 1944 average expenditure of ammunition was as follows: 16,000 1936-1937 88 mm antiaircraft gun shells, 8500 1941 88 mm shells, or 6000 105 mm shells.

According to the calculations of foreign experts, such a substantial expenditure of ammunition resulted in the total cost of expended rounds being as a rule several times the value of a downed aircraft. But it is assumed that the damage which one aircraft could cause exceeds by severalfold the cost of the expended antiaircraft shells.

Analyzing statistical data, some foreign military experts concluded that in spite of improvement of antiaircraft artillery systems, the expenditure of ammunition per downed aircraft depends to a determining degree on the speed of the aircraft (Figure 1) [not reproduced] and in present-day conditions would amount to approximately 8500 medium and small-caliber shells. In their opinion a larger caliber will not produce any appreciable decrease in expenditure of ammunition. This has supposedly resulted in the fact that ground forces air defense consists of 20-40 mm artillery systems, while large-caliber guns have been entirely replaced by antiaircraft missile systems.

Studying the experience of local wars, NATO experts concluded that the average expenditure of antiaircraft missiles per downed aircraft is 100 to 200 times less than that of antiaircraft artillery shells. But nevertheless, in their opinion it remains fairly high -- an average of 50-60 missiles per downed aircraft. At the same time it is emphasized in the foreign press that expenditure of missiles deviates more considerably from the average than expenditure of artillery shells with a change in the conditions of combat between aircraft and air defense. According to reports in the Swiss journal INTERNATIONAL DEFENCE REVIEW, during certain periods of combat operations in local wars, as well as during engagement of small groups of aircraft and individual aircraft, it declined to 3-6 and even 1-2 missiles. In other instances, however, it increased to 100 and more. As a rule, however, these deviations were due, in the opinion of NATO experts, either to serious miscalculations on the part of aircrews and their controlling entities or deficiencies in disposition and tactics of air defense forces.

The average level of aircraft losses to hostile ground air defense weapons depends on a number of factors, among which Western military experts consider the correlation of technical parameters between aircraft and antiaircraft systems to be dominant, as well as the quality of operational-tactical leadership of forces and assets. At the beginning of World War II, for example, the level of Anglo-American aircraft losses in Europe was approximately 2 percent, while it had increased to 4 percent by war's end. One of the main reasons for this was improvement of German antiaircraft artillery systems.

As regards the postwar period, the foreign military press noted that the level of U.S. air losses in Korea was 2-3 percent, while during the years of U.S.

aggression in Vietnam it fluctuated across a fairly broad range. In 1966, for example, according to figures in the U.S. press, it was only 0.5 percent. They failed to consider, however, the fact that at the time only one fifth as many missions were being flown over North Vietnam as over South Vietnam. NATO experts believe that the level of losses was approximately 3 percent for missions over North Vietnam in that period.

During the 1973 war in the Near East the average level of Israeli aircraft losses, according to figures in the foreign press, was 0.8 percent. It was much greater, however, for certain types of aircraft in performing certain specific missions. It was 1-1.5 percent, for example, for A-4 Skyhawk ground attack aircraft, which flew primarily missions of close air support of ground forces.

Separately analyzing helicopter losses, U.S. experts classify them as follows: hit, mission abort, and downed. According to the experience of the war in Vietnam, the first category occurred once in 450 sorties, the second once in 700, the third -- once in 20,500.

Emphasizing that the majority of U.S. helicopter combat sorties were flown over South Vietnam, NATO military experts feel that these figures cannot be used to formulate plans and analyze results of military operations in the conditions of Europe.

It might seem at first glance, as Western military experts note, that the above figures attest to an insignificant contribution by air defense forces toward repelling hostile air attacks. In their opinion, however, the actual level of prevention of damage to the targets defended by them was many times greater than the level of aircraft losses. During the war in Vietnam, for example, U.S. command authorities, due to aggressive air defense countermeasures, were forced to assign up to 50 percent of sorties to fire and electronic suppression of antiaircraft weapons. As a result, only about 50 percent of the aircraft participating in a raid were able to perform basic combat missions. Some were neutralized by the actions of Vietnamese People's Army (VPA) fighter aircraft. In addition, the effect of air defense forces and the fear of being shot down resulted in many U.S. aircrews attempting to disengage as quickly as possible. Because of this, the accuracy of employment of their weapons deteriorated sharply, and frequently they would drop their lethal cargo randomly, without even aiming. In addition to destroyed (downed) aircraft, other aircraft sustained serious damage, to repair which required time (from several hours to several days), during which they could not take part in combat operations. Evaluating all these factors, Western military experts were forced to acknowledge that the level of prevention of damage as a result of the actions of VPA air defense forces was many times greater than the level of U.S. aircraft losses.

NATO command authorities, aware of the above, consider engagement of hostile air defense, and particularly enemy antiaircraft weapons, to be one of the most important missions, and aircraft to be the principal means of accomplishing it. They are endeavoring to establish in peacetime sufficient air forces capable of neutralizing and penetrating the opposing air defense system with minimal losses.

Toward this end NATO is conducting a number of measures to improve the technical equipment of the air forces and their organizational structure, as well as development of tactics.

As regards improving technical improvement of air forces to perform this task, U.S. military leaders and NATO command authorities are placing great hopes on implementation of the Wild Weasel program. A special aircraft, the F-4G (in the foreign press it is named after the program), has been developed, an aircraft designed to combat antiaircraft missile and artillery systems, and subunits equipped with these aircraft are being formed. As is reported by the foreign press, the first such subunits were formed by the U.S. Air Force during conduct of the aggressive U.S. war in Southeast Asia. Initially, however, they were equipped not with special aircraft but with conventional F-4D and F-105 tactical fighters.

The F-4G Wild Weasel aircraft carry hostile radar emissions detection gear and a sophisticated system of weapons guidance against enemy radars. For fire suppression of antiaircraft missile systems, which are the main targets of attack by these aircraft, the latter carry antiradiation and conventional guided missiles, guided bombs, and cluster munitions. All this, in combination with specially developed tactics, makes the F-4G, U.S. experts believe, highly effective against enemy ground air defense weapons.

Pilots selected for subunits equipped with F-4G aircraft must meet stringent requirements. They must all have considerable flying experience in F-4 or F-105 tactical fighters and be a flight leader or higher. In addition, since during combat they will frequently have to be first to enter a hostile air defense zone and the last to leave it, they must possess consummate mastery of air-to-ground and air-to-air weapons, as well as the tactics of attacking ground targets and air combat.

As was reported in the foreign press, the tactics of F-4G subunits are based on combined utilization of the aircraft's maneuver and fire capabilities, close group coordinated action, and skilled employment of electronic countermeasures. In the view of U.S. experts, a combat mission will be flown by a small group (from a 2-aircraft to a 3-aircraft element). The actions of each aircrew and the entire element must be closely coordinated. We discuss below some points of tactics employed by 2-ship elements of F-4G aircraft, discussed in the U.S. journal AVIATION WEEK AND SPACE TECHNOLOGY.

Aircraft usually take off in pairs. Following a prescribed route at an altitude of 7000-8000 meters, aircrews conduct preliminary reconnaissance of antiaircraft missile radio electronic systems.

On approaching the maximum point of aircraft detection by enemy radar, both aircraft may drop in altitude. But in many instances one descends to a low level, while the other continues to fly at a medium or high altitude, acting as bait, as it were, for antiaircraft missiles, seeking to draw the attention of launcher crews and to force them to switch on missile guidance radars. This, according to U.S. experts, makes it possible to fire antiradiation missiles in a timely manner and thus on the one hand to neutralize a detected radar site and, on the other hand, to give target designation to the aircrew approaching the antiaircraft missile site at low altitude.

One technique used in attacking antiaircraft missile sites is the attack with Shrike antiradiation missiles and cluster bombs. The first aircraft fires missiles timed to hit the control radar just at that moment when the other aircraft commences maneuver to bomb the antiaircraft missile launch positions. In the course of combat maneuvering, the crews of the F-4G aircraft should maintain as high a speed as possible, continuously execute antiaircraft maneuvers close to the target, and utilize the terrain for cover and concealment. If there are active enemy air defense weapons in the area, they must mutually support one another. For example, if one of the aircraft is illuminated from the flank by antiaircraft missile radar, the other should neutralize it.

The F-4G would be used both for independent actions and in groups of tactical fighters and ground attack aircraft on strikes against targets with strong air defense. In the latter case they have the mission of ensuring the safety of the attacking group en route and of neutralizing antiaircraft missile and artillery forces defending the main target.

As is noted in the Western military press, in present-day conditions subunits containing F-4G Wild Weasel aircraft are clearly insufficient to combat enemy air defense weapons. Therefore air force command authorities of the NATO member nations intend to designate for this purpose a substantial number of conventional tactical fighters. In the process of combat training, their crews learn to engage ground air defense weapons. Tactics are perfected as a rule in conditions maximally approximating actual combat. For this purpose special ranges are set up with dummy antiaircraft missile launchers, antiaircraft artillery positions and radio electronic equipment simulating the operation of corresponding elements of the adversary's air defense system. They do not conceal the fact that the adversary is primarily the Soviet Union and the other nations of the socialist community.

As is indicated by the foreign press, in devising tactics they consider to a maximum degree the experience of air combat in local wars, with adjustments to the specific features of the European theater. In the opinion of foreign experts, NATO air forces have already amassed a substantial arsenal of tactics which ensure diminished effectiveness of hostile air defense weapons fire, neutralization or total annihilation of antiaircraft missile batteries in their positions.

NATO military experts place great hopes on electronic countermeasures employed by aircraft at a stand-off distance (as a rule above territory occupied by friendly forces), under the protection of which a more concealed approach by combat aircraft to ground targets is possible.

The United States has developed and is testing in exercises the EF-111A electronic warfare aircraft, with the mission of supporting attacking groups of tactical fighters operating deep within enemy territory. It will escort these groups, providing electronic suppression of antiaircraft missile and artillery control systems en route to the target and target antiaircraft defenses.

Employment of guided weapons, which can attack targets without the launching aircraft coming within effective range of antiaircraft missile and artillery, or at least spending a minimum time within range, is considered one of the ways for aircraft to penetrate a target's air defense system. This is more difficult when aerial bombs, rockets and aircraft cannons are employed. In the view of foreign experts, as a rule this requires direct visual contact with the target. Even flying at low level does not always protect an aircraft against being hit by antiaircraft missiles and artillery. Such was the case in particular in the 1973 Arab-Israeli War, when the strong air defense established by the Arabs on the Golan Heights and on the east bank of the Suez Canal thwarted the plans of Israel's military leaders to wipe out an enemy armored force with tactical airstrikes.

On the experience of this and other local wars, a tactic was devised which is employed today at NATO nation air force exercises -- attacking with a steep dive in the so-called "dead zone" of an antiaircraft missile or artillery system, in which an aircraft cannot receive fire (Figure 2) [not reproduced]. In this case the approach to the point of initiation of the target attack maneuver is made at altitudes above the limit of effective antiaircraft missile and artillery fire. The attacking aircraft departs at low level, in the direction of least threat.

The question of teamwork and cooperation between attack aircraft and helicopters for neutralizing antiaircraft missile and artillery positions is periodically raised in the foreign press. One version of such teamwork is shown in Figure 3 [not reproduced]. It involves a tactical fighter and a helicopter. The fighter approaches the possible antiaircraft missile launcher position area at an altitude which is virtually unreachable to an antiaircraft missile, and then, executing a shallow dive and periodically altering course, closes the presumed target location. The exact location of the antiaircraft missile system is determined by the helicopter crew from the launching of a missile. The helicopter immediately informs the pilot of the fixed-wing aircraft on the moment of missile launch and the launcher coordinates. The pilot executes a vigorous missile-evasion maneuver, employs available airborne countermeasures (releases an infrared decoy, chaff, switches on active jamming gear), and then attacks the antiaircraft missile position. In a certain situation the aircraft draws antiaircraft fire with a feinting maneuver, while the helicopter or group of helicopters attacks the missile position.

Judging from reports in the foreign press, the NATO nation armed forces are also developing other methods and tactics of countermeasures against hostile ground air defense weapons.

In addition to the above, NATO military leaders devote considerable attention to command and control. They believe that the greatest effectiveness of aircraft against air defense forces is achieved when all forces are centrally directed. In the view of NATO military experts, this contest is one of the important areas where the mission of achieving air supremacy is accomplished, and therefore centralization of control, in addition to air, should also extend to friendly ground air defense forces, regardless of the combat arm to which they belong. In conformity with this, air forces and air defense comprise a unified whole in the organizational structure of NATO Joint Forces.

Thus, as follows from materials in the foreign press, NATO forces command authorities attach great importance to the problem of the contest between aircraft and enemy ground air defense weapons. They acknowledge that the most expedient is a combined solution on the basis of carrying out a number of technical, organizational, and operational-tactical measures.

3024
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COMMENTS ON U.S. AIRCRAFT-LAID MINE SYSTEMS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 59-64

[Article, published under the heading "Air Forces," by Engr-Col (Res) S. Chernov: "Aircraft Mine-Laying Systems"; passages rendered in all capital letters printed in boldface in source]

[Text] Aircraft mine-laying systems, which are a component part of the armament of tactical fixed-wing aircraft and helicopters, are means of laying minefields which can be set up at great distances from the position of friendly troops in an extremely short time.

Such mines were first developed and practically employed in the mid-1960's, when the United States was waging an aggressive war in Southeast Asia. Judging from reports in the foreign press, they would be placed on probable routes of movement of patriotic forces subunits, in their assembly area, and simply wherever activity by the local civilian population was noted. As a result it frequently happened that civilians, for the most part women, the elderly, and children became the victims.

The specific features of the conditions of conduct of such combat operations dictated the employment of mines of different types. These were for the most part antipersonnel mines, of a specific shape and quite small, which made it possible to place them in substantial quantities and made detection on the ground difficult. In addition, U.S. Army and Marine subunits would frequently employ flare mines, with the aid of which they would determine the enemy's approach to defended positions or installations. According to figures published in the foreign press, U.S. industry produced more than 114 million antipersonnel mines and flare mines for the Air Force just at the beginning stage of the war (1966-1968); the bulk of these were employed by the aggressors in Southeast Asia. As for antitank mines, during the entire period of combat operations the Americans developed and used only one model of this type of mine designed to be deployed from the air.

Aircraft mine-laying systems consisted of the following basic components: cluster bomb and cluster mine units, mines and minelaying control equipment. Mines were laid by Air Force and Navy tactical aircraft, Army and Marine fixed-wing and rotary-wing aircraft.

CLUSTER BOMB UNIT. A nonreleased multipurpose device, intended as a rule to be loaded with various small munitions, including mines. Contains several vertical tubular guides (each containing a mine cluster). The unit's bottom cover is removed prior to takeoff.

CLUSTER MINE UNIT. A lightweight container cylindrical or prismatic in shape, into which mines are placed. For example, the cylindrical CDU-2/B unit contained 120 BLU-43/B high-explosive antipersonnel mines, and the SUU-13/A cluster bomb unit contained 40 such mine containers. An explosive cartridge is placed in the upper part of the cluster mine unit, which fires it from the tube. After firing it opens, and the released mines are scattered by the airstream and fall to earth.

MINES. In the 1960's and 1970's the United States developed and tested in combat conditions more than 10 models of cluster mines, the most widely used of which were the following:

the BLU-43/B high-explosive antipersonnel mine (code-named "Dragon Tooth"). It consists of a soft plastic case filled with a liquid explosive. It has a flat triangular-shaped stabilizer for stabilization in flight; the explosive is automatically neutralized after a certain time ("short," to use the U.S. terminology). Another version, designated BLU-44/B, is similar, but the explosive charge remains potent for a longer time.

The XM41EI high-explosive antipersonnel mine. Developed by the U.S. Army for a helicopter minelaying system, but it was also employed in Air Force systems. The mine is in the form of a cloth pouch filled with lead azide (Figure 1) [not reproduced]. It is activated by pressure on the pouch. Similar to the BLU-43/B, it self-neutralizes after a certain time.

The BLU-42/B fragmentation antipersonnel mine. Based on the BLU-26/B small aerial bomb. It is a sphere with projections for aerodynamic stabilization, filled with an explosive charge. It has an electromechanical fuze, and is equipped with four fine tension wires, which are thrown to the sides by springs after the mine hits the ground. The mine is activated when one of the wires is touched, which changes the position of the mine and detonates it. The mine self-destructs after a certain time. There is also another model (BLU-54/B), which differs only in time to self-destruction.

The BLU-45/B belly attack antitank mine. A square-section steel case, in the shape of a small high-explosive aerial bomb with stabilizer which deploys in flight. Contains a shaped charge and a magnetic proximity fuze, which detonates the charge as the target passes over it. The mine self-destructs a predetermined time after deployment.

XM40 flare type signal mine. Similar to the XM41E1 antipersonnel mine, but smaller. When stepped on, it gives a loud report accompanied by a bright flash.

The principal specifications and characteristics of several U.S. Air Force aircraft minelaying systems and cluster mines, based on materials in the foreign press, are contained in the table [not included].

MINELAYING CONTROL EQUIPMENT. It consists of devices carried on board the fixed-wing aircraft or helicopter, an intervalometer, contained in the cluster bomb unit and precisely activating the explosive charges at the specified rate and sequence of firing the cluster mine units (in conformity with the required dimensions and density of the minefield), and a set of cables, connected to the aircraft power supply and control devices.

According to reports in the Western press, U.S. aircraft employed mines together with other types of munitions, in order to make it as difficult as possible for the enemy rapidly to repair and rebuild installations destroyed by air attack. As a rule mines would be dropped from medium altitudes and at a time of day when it was most difficult to observe these operations, that is, at twilight. Also typical was the employment of minelaying systems together with reconnaissance-warning devices designed to detect moving enemy subunits (by means of acoustic, seismic, magnetic, and other sensors) and to transmit data to collection and processing points. After this information had been analyzed, a countermeasures decision would be made: to bomb, mine, or mount an airborne assault.

As is indicated by the foreign press, at the present time active efforts are in progress in the United States, on the basis of study of the experience of minelaying from the air, to develop new aircraft minelaying systems with general purpose cluster bomb units which can take small munitions of various types: antitank, antipersonnel, as well as special munitions, particularly for putting airfields out of action. Subsequently such cluster units would be employed as a module of a weapon system which will have its own propulsion system and guidance equipment. This, in the estimate of U.S. experts, will make it possible to employ such a weapon at considerable distances from the forward edge of the battle area without the mine deploying aircraft coming within range of hostile air defense weapons (an example is the LAD guided cluster bomb which is under development).

It is believed that with a single cluster bomb, containing mines of various types, antitank and antipersonnel mines in a ratio of 3:1, for example, it would be possible not only to lay an effective minefield but also to make it difficult for the enemy to reconnoiter and cross it. In addition, it is planned to include in aircraft minelaying systems general purpose mines which are being developed for all branches of service and would be laid by various means. We include below information on several aircraft-laid mine systems under development.

The Gator system, as its authors envisage, will be employed by tactical fixed-wing aircraft and helicopters. It includes the BLU-91/B belly attack antitank mine and the BLU-92/B antipersonnel fragmentation mine, the body of which is identical in shape and size. The BLU-91/B contains a directional charge, a magnetic proximity fuze, an antihandling device, and a self-destruct unit, which detonates a specified time after deployment in order not to hinder maneuver by friendly troops on mined ground after the obstacle has completed its mission of containing or delaying the adversary. The BLU-92/B mine (Figure 2) [not reproduced] also has a fuze with a self-destruct mechanism. After striking the ground, four thin tension wires deploy from the mine body; when one of these is touched and the position of the mine changes, it is detonated.

Several versions of the Gator system are envisaged, depending on type of cluster bomb unit. The CBU-78/B system, for example, uses the SUU-58/B cluster bomb unit, BLU-91/B and BLU-92/B mines, while the CBU-86/B system employs the SUU-54A/B cluster bomb unit and the BLU-92/B mine, etc. According to calculations by U.S. military experts, a tactical aircraft will be able to carry three SUU-54A/B cluster bomb units or 6 SUU-58/B or SUU-68/B units (Figure 3) [not reproduced]. They carry a sufficient number of mines to lay a minefield measuring 200 x 300 m. Mines will be released from an aircraft height of not less than 60 meters, at a speed of up to 1500 km/h. It is expected that the Gator system will become operational in 1983. It is believed that this new system will be employed primarily for mining enemy territory for the purpose of delaying the advance of enemy support echelons and reserves to the forward edge of the battle area.

The ERAM (Extended Range Antiarmor Munition) system is a part of an aircraft antitank weapons system being developed on a special program. It will consist of a general purpose cluster bomb unit containing mines to be laid along roads where movement of enemy tank and mechanized units is expected. It is noted in the foreign press that a characteristic feature of the new mines will be their capability to attack the least-protected part of armored vehicles -- the hull roof plate.

This project is at the stage of selection of optimal munition design. Two U.S. companies are involved, which are engaged in competitive development of mines for ERAM for the U.S. Air Force. In particular, the Avco Company has proposed the BLU-101/B mine. This is a complex device which consists of a cylindrical base, a so-called launcher mounted on the base (it rotates and is designed to fire two munitions containing a directional charge), a radar (operates in the millimeter band) and an infrared target detection sensor (Figure 4) [not reproduced]. The mine is provided with a parachute, on which it descends to earth at a rate of 15 m/s following release from the cluster bomb unit.

The BLU-101/B mine operates as follows. Upon landing, the parachute is detached, and antenna probes deploy, after which target search commences and internal electronic circuits switch on. When a target is detected and identified, the launcher aims and fires (at an elevation angle of 45°) one of the projectiles which, while in flight, locks onto the target with its sensor and triggers the directional charge, which pierces the hull roof plate of the moving armored vehicle. After this the launcher turns 180°, readying to fire the next projectile.

The BLU-102/B mine is being developed by Honeywell. It is also dropped by parachute from a standard cluster bomb unit, and upon landing would assume a position close to vertical. When a moving target is detected and identified, a projectile carrying a sensor is fired in the required direction. At a specified height this projectile deploys a parachute, the sensor locks onto the target, and a directional charge is triggered.

U.S. military command authorities plan to conduct evaluation tests of experimental models of the new mines in 1982, while final selection of the model for completing development and adoption is scheduled for 1985.

The MOWAM (Mobile Water Mine) antiamphibious mine is designed to block enemy tanks and amphibious vehicles fording or swimming across water obstacles. It weighs 20 kg, is 1000 mm in length, and has a body diameter of 200 mm. It is in the form of a torpedo and is equipped with a small solid-propellant rocket motor and sensors: a seismic (located in the anchor device) and an acoustic (in the nose) sensor. After release from a helicopter, the mine descends vertically to the bottom of the river and remains there until the seismic or acoustic sensor detects a target. Received signals are processed by a microcomputer, the motor is ignited, and the mine proceeds toward the target at high speed. The attitude change to travel in a horizontal direction is accomplished by two pairs of jet vanes, while guidance to the target is accomplished by the special unit equipped with an active hydroacoustic device and a magnetometer.

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COMMENTS ON NATO NAVAL EXERCISES IN THE ATLANTIC

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 69-75

[Article, published under the heading "Naval Forces," by Capt 2nd Rank A. Orlov: "Naval Forces in NATO Joint Forces Exercises in the Atlantic"; passages rendered in all capital letters printed in boldface in source]

[Text] Maneuvers and exercises occupy a prominent place in the military preparations which are being carried out at a rapid pace by U.S. ruling circles and their aggressive NATO bloc partners. These preparations are being conducted in various parts of the world and constitute undisguised militarist shows of force, the purpose of which is to intimidate the peoples of the world, to heat up the international situation to an even greater degree, and to create an atmosphere of war psychosis. Evidence of this is the interlinked exercises conducted by NATO joint forces in the Atlantic, code-named "Ocean Venture," "Magic Sword," and "Ocean Safari," held from 1 August through 19 September 1981.

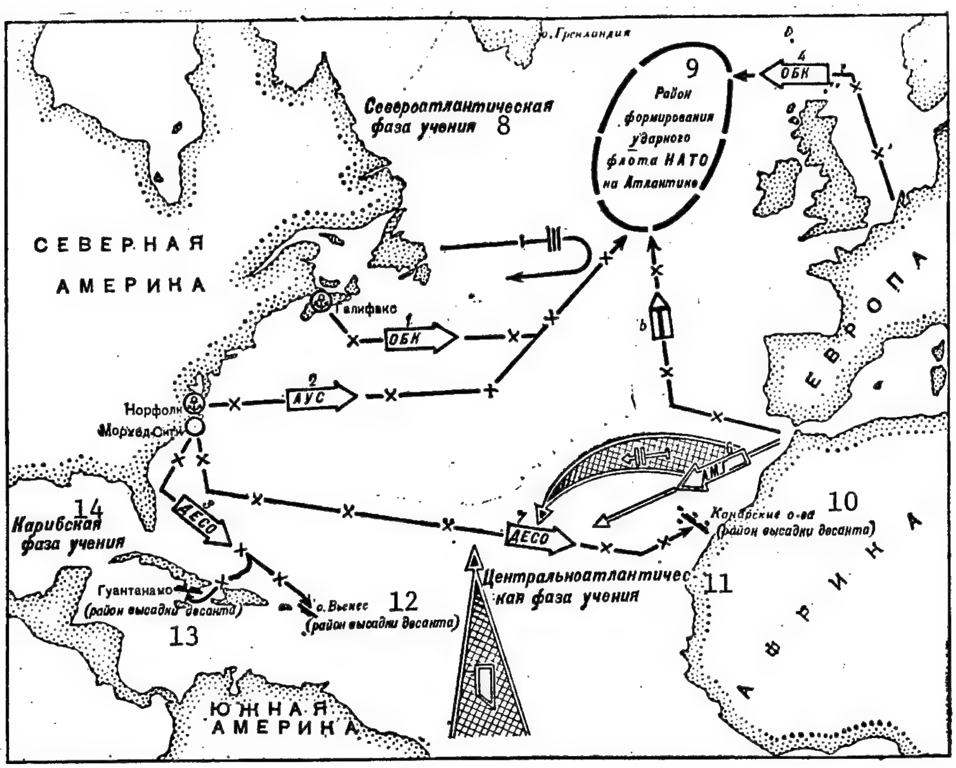
The area in which they were held included the Central, Western, Eastern, and North Atlantic, the Caribbean, Norwegian and North seas, as well as the English Channel and the Baltic straits. Participating were more than 250 warships and auxiliary vessels and as many as 1000 aircraft -- carrier-based, naval shore-based patrol, air force strategic and tactical -- of the United States, Canada, Great Britain, the FRG, Norway, Denmark, the Netherlands, Belgium and Portugal, as well as France and Spain. Also involved in these exercises were U.S. and Dutch marines and ground forces units and subunits of various NATO countries. More than 120,000 men took part.

Overall direction of the exercise was assumed by U.S. Admiral H. Train, supreme allied commander, Atlantic, while the NATO Joint Forces area commanders for the Atlantic and the task group commanders directed the operations of the forces.

Judging from reports in the Western press, the general plan of the exercise was based on provocational variants of initiation of armed conflicts initially in the Caribbean basin, and subsequently in the North Atlantic, leading to a sharp aggravation of the situation and initiation of combat operations in maritime and land theaters between "Blue" (NATO Joint Forces) and "Orange" (the adversary) forces. The role of the aggressor was assigned to the Orange forces,

which in June-July, under the pretext of an exercise, proceeded to deploy submarines, surface units and naval aircraft from their permanent bases to areas of most intensive shipping in the South Atlantic and Caribbean, with the aim of disrupting maritime shipment of raw materials imported by the Western nations, particularly oil, of disorganizing their economies and forcing them to make concessions. The mass information media of the Orange forces organized an aggressive propaganda campaign, aimed at disrupting the unity of NATO, at preventing Spain from joining NATO, and at giving comprehensive support to the countries of the Caribbean basin in their struggle for political and economic independence. Acts of organized sabotage commenced in the seaports of the Blue countries. A U.S. embassy was seized in one of the Central American nations.

In these conditions the Blue military and political leaders, appraising the developing situation as threatening, made the decision to form NATO joint carrier strike forces, ASW and other forces, to use them to reinforce NATO forces in the most important ocean regions, and to establish control in these regions.



Deployment of Forces in Ocean Venture 81 Exercise

Key:

1. Force of Canadian warships
2. Carrier task force consisting of the U.S. nuclear carrier "Dwight D. Eisenhower," (cont'd) the British ASW carrier "Invincible," and escorts

(Key to figure on preceding page, cont'd)

3. Force of amphibious warfare ships (U.S. amphibious assault ship "Guam" and escorts)
4. Force of British and Dutch warships
5. U.S. aircraft carrier "Forrestal"
6. Multipurpose carrier group (Spanish carrier "Dedalo" and escorts)
7. Amphibious force (U.S. amphibious warfare ship "Saipan" and escorts)
8. North Atlantic phase of the exercise
9. NATO Striking Fleet Atlantic assembly area
10. Canary Islands (amphibious landing objective area
11. Central Atlantic phase of the exercise
12. Island of Vieques (amphibious landing objective area)
13. Guantanamo (amphibious landing objective area)
14. Caribbean phase of the exercise

The Orange forces, in a preemptive move before the Blue forces could deploy, commenced combat operations in the Atlantic. They sought to disrupt sea lines of communication, to prevent redeployment of troops from the United States to Europe, and at the same time were completing preparations for offensive operations in European land theaters.

In response, the Blue side was to place its armed forces on a war footing, place them under a unified command, deploy carrier and ASW forces in the Northeastern Atlantic and Norwegian Sea, contain the operations of Orange forces in the Western Atlantic and Caribbean, and subsequently execute a number of operations to gain supremacy in the North Atlantic and Norwegian Sea, move reinforcements and military supplies from the United States to Europe and, by means of joint operations of ground forces, air and naval forces, force the "aggressor" to abandon his plans.

Events at the exercise unfolded in conformity with this scenario.

THE OCEAN VENTURE 81 EXERCISE ran from 1 August to 19 September and was subdivided into Caribbean, North Atlantic, and Central Atlantic phases (deployment of forces is shown in the accompanying illustration).

The Caribbean phase (1-20 August) encompassed the Western Atlantic and Caribbean areas. Participants included more than 20 warships and auxiliary vessels of the navies of the United States, Great Britain and Netherlands, the Standing Naval Force Atlantic, more than 100 carrier-based, shore-based patrol and tactical aircraft, the U.S. 38th Marine Battalion (1100 men), a battalion task force of Dutch marines (400 men from the island of Curacao), elements of the special Ranger forces and the 101st Airborne Division, as well as B-52 strategic bombers and military transport aircraft.

Principal attention was devoted to working on problems of gaining supremacy off the U.S. East Coast and in the Caribbean, preparation for and execution of a combined amphibious assault operation.

In conformity with the general plan of the exercise, on 1 August Orange submarines, operating from bases in a Latin American country, sank in the South Atlantic several merchant vessels belonging to Western countries. In response U.S. Navy command authorities deployed ASW forces from naval bases at Norfolk, Charleston, and elsewhere. In a period of 2 days (2-3 August) surface warships, working jointly with shore-based patrol aircraft and embarked helicopters, established control over a zone running along the U.S. East Coast from Norfolk, Virginia to the Florida peninsula and created favorable conditions for forming an amphibious landing force, tasked with capturing the "aggressor" submarine base. It was emphasized in the foreign press that Cuba was one of the most probable countries in which an invasion operation might actually take place. It is therefore not surprising that the amphibious operation was to take place close to the Island of Freedom.

On 3 August an amphibious force was formed in the Norfolk area, consisting of the amphibious assault ship "Guam," 2 tank landing ships and 2 dock landing ships. Ships of NATO's Standing Naval Force Atlantic provided protection of the assembly area. When the force was assembled, it proceeded to Morehead City, North Carolina, where it took on 1500 U.S. and Dutch marines, plus combat equipment. Escort forces were joined by a guided missile cruiser, a destroyer, and 5 frigates.

It took the amphibious warfare ships 6 days to reach the island of Vieques (off the island of Puerto Rico), where an amphibious landing force and airborne assault troops were to be put ashore, with the objective of capturing this Orange-held island. Passage to the objective area was accomplished in conditions of countermeasures by Orange submarines and aircraft, which mounted several torpedo, bombing and low-level attacks.

On 9 August 325 Rangers, transported from Norton Air Force Base, Virginia by 12 C-141 military transports, were dropped deep in the interior of the island of Vieques. Preparation of the beach objective area for landing Marines began simultaneously with this. B-52 bombers were employed to support the Blue landing forces. After flying to the objective area from U.S. air bases, they descended to an altitude of 250 meters and bombed Orange antiamphibious defenses. As was emphasized in the foreign press, this type of employment of strategic bombers (but from higher altitudes) was last used during the war in Vietnam.

The amphibious landing on the island of Vieques, scheduled for 11 August, was postponed by approaching hurricane Dennis. The amphibious warfare ships proceeded to sheltered anchorages and, after the hurricane passed, headed toward the Cuban coast.

The U.S. naval base at Guantanamo Bay was chosen for rehearsing missions of capturing important objectives on foreign soil. On 14 August an amphibious force was landed at Guantanamo, and for several days troops worked on missions involving capture of important Orange government establishments, industrial and military installations. They also worked on tasks of "freeing" and evacuating the families of base personnel, supposedly seized by that country's population. These actions were of an undisguised provocational character and pursued the aim of intimidating the peoples of Central America.

The Caribbean phase of the exercise ended after the amphibious force, having completed its mission of "invading" one of the countries of the Caribbean region, returned to Morehead City on 20 August.

A joint exercise involving the U.S. Navy and a number of Latin American countries, code-named Unitas-22, commenced at the same time as Ocean Venture 81 in the South Atlantic and Caribbean. The purpose of this exercise was to rehearse plans of utilizing naval forces to defend sea lines of communication in the South Atlantic. More than 30 warships and auxiliary vessels of the navies of Argentina, Brazil, Colombia, Uruguay, and Venezuela took part in the various stages of this exercise.

Since the scenario of the Ocean Venture exercise specified that the Western countries, in conditions of deterioration of the international situation, were to withdraw into the South Atlantic and Caribbean more than 1600 merchant ships, with these vessels to be defended by the ships and aircraft of the Latin American countries, the United States unilaterally decided to rehearse these moves in a practical manner, that is, to involve them in Ocean Venture. Thus another provocational aim was being pursued -- by means of holding exercises in the South Atlantic, to attempt to expand the NATO zone of "responsibility" to this region.

Such actions by U.S. command authorities not only angered the world community but even some of the NATO partners. The Norwegian Government, for example, and subsequently the Danish Government as well, voiced a protest, which went as far as a threat not to participate in the exercise. As a result the United States was forced to make an official statement and acknowledge that Unitas-22 was not a part of the NATO Ocean Venture exercise and was being executed according to a separate, prior devised plan. In actual fact, however, many of its elements were executed on the general operational-strategic background of the NATO forces exercise in the Atlantic. Unitas-22 continued in the South Atlantic up to the end of September.

The North Atlantic phase ran from 19 August to 1 September in the Western, Eastern, and North Atlantic areas. It involved more than 60 warships and more than 300 carrier-based and shore-based patrol aircraft as well as air force tactical aircraft of the United States, Canada, Great Britain, the FRG, the Netherlands, and Portugal.

Particular importance was attached to rehearsing final measures to shift naval forces from a peacetime to a war footing, transferring them under operational NATO command, and subsequent utilization in operations of the initial period of a war.

In conformity with the exercise scenario, in July-August the situation in that region of the world became sharply deteriorated. The U.S. Navy announced mobilization of reservists and proceeded to demothball reserve fleet warships and aircraft. On 19 August naval ships were placed on an advanced-stage alert. ASW ships, together with shore-based patrol aircraft and embarked helicopters, proceeded to search for submarines off the Virginia coast. Several days later the U.S. nuclear carrier "Dwight D. Eisenhower," the British ASW

carrier "Invincible," escort ships, as well as ships of the NATO Standing Naval Force Atlantic departed from the Norfolk naval base. Not far from base they formed up into cruising order, and on 22 August set course for Europe. They were subsequently joined by a Canadian squadron consisting of five destroyers and frigates. During the transatlantic passage all types of carrier task force defense actions were rehearsed. An important role in accomplishing the ASW defense mission was assigned to the carrier "Invincible," which steamed ahead of the force and maintained an ASW search with its sonar and Sea King ASW helicopters. P-3C Orion (USA) and Aurora (Canada) shore-based patrol aircraft, operating from bases in North America and Iceland, also were enlisted in the ASW effort.

On 23 August a second U.S. carrier, "the Forrestal," steamed out of the Mediterranean into the Atlantic and set course for the Norwegian Sea.

The carriers rendezvoused south of Iceland at the end of August. A force of British, Dutch and other European NATO nation warships also arrived in the rendezvous area. Within a few days the NATO Striking Fleet Atlantic was assembled. It totaled 50 warships, including two multipurpose carriers and one ASW carrier.

On 1 September the ships of the NATO Striking Fleet crossed the line running from Iceland across the Shetland and Faeroes and proceeded with the scenario of gaining supremacy in the Norwegian Sea and providing direct air support to NATO ground forces on the Northern flank.

Practical operations involved in accomplishing these missions were executed in an independent NATO Joint Forces exercise code-named Magic Sword.

The Central Atlantic phase ran from 1 to 19 September in the Western and Iberian Atlantic.

Participants in this phase included more than 30 warships and auxiliary vessels and 100 fixed-wing aircraft and helicopters of the U.S., British, Portuguese, and Spanish navies.

Principal attention was focused on assembling an amphibious force off the U.S. East Coast and escorting it across the Atlantic in conditions of countermeasures by Orange surface units, submarines and aircraft.

The exercise scenario stated that preparation of amphibious forces and their transit from the United States to Europe, with the objective of reinforcing NATO forces on the flanks, were to take place at the same time as carrier and ASW forces of the NATO Striking Fleet Atlantic were engaged in combat operations to gain superiority in the Norwegian Sea and North Atlantic.

Over a period of several days preparatory measures for embarking Marine units and combat equipment on amphibious warfare ships and transports were being carried out in the United States. At Morehead City on 3-4 September the 32nd Battalion of the U.S. 2nd Marine Division was being loaded onto the general purpose amphibious warfare ship "Saipan," the amphibious assault ship

"Guam," and two other amphibious warfare ships. Several hours later they put to sea and formed up in cruising order. Escort forces totaled five ships, including a guided missile cruiser. Transit from the U.S. East Coast to the Canary Islands took 10 days.

In conformity with the plan of the exercise, on 15 September a Spanish Navy general purpose carrier group, consisting of the carrier "Dedalo" and five escorts, put out to meet the amphibious force. An encounter and engagement between the escort ships of the amphibious force and the Spanish ships, acting as an Orange antiamphibious force, was played out south of the Canary Islands. The antiamphibious force was supported by Spanish air force and naval aircraft from the Canaries. As was emphasized in the foreign press, after two days of fighting, the antiamphibious forces succeeded in sinking several amphibious warfare ships and preventing the Blue force from landing on the Canary Islands.

On 18 and 19 September U.S. and Spanish ships worked on problems of joint-force steaming, engaging "aggressor" submarines and aircraft, and also escorted an ocean convoy, played by the amphibious force.

The Central Atlantic phase was completed with the convoy's arrival at Spain's Rota naval base.

In the opinion of Western military experts, the naval ships of Spain, which was accepted into the NATO bloc in December 1981, demonstrated a relatively high level of combat readiness and are that country's best prepared branch of service.

THE MAGIC SWORD EXERCISE was a logical continuation of the North Atlantic phase of the Ocean Venture-81 exercise. It was held in two stages, each of which contained specific features.

The first stage was conducted in the Norwegian Sea on 2-4 September, under the code-name Magic Sword North. Participants included the NATO Striking Fleet Atlantic, formed during the North Atlantic phase of the Ocean Venture exercise, as well as warships, auxiliary vessels, shore-based patrol and tactical aircraft belonging to Norway, the FRG, and Denmark. More than 60 warships and 200 aircraft participated.

Principal attention was devoted to engaging Orange warship forces in the central part of the Norwegian Sea and providing direct air support to NATO ground forces in North Norway. The principal attacks on "aggressor" warships were flown by Intruder and Corsair attack aircraft from the U.S. carriers "Dwight D. Eisenhower" and "Forrestal." More than 100 sorties were flown each day in performing this mission.

No fewer than 200 sorties were flown from these carriers, which were maneuvering 400-500 km from the coast, to provide air support to Blue ground forces along the coast. The aircraft simulated low-level attacks on concentrations of Orange personnel and equipment in their rear areas, at a distance of more than 800 km from the carriers.

After completing work on these missions, a large number of the ships, including the carrier "Forrestal," left the exercise. The remaining ships proceeded to the North Sea, where they participated in the second stage.

The second stage was code-named Magic Sword South, and took place in the North Sea on 7-8 September. It involved as many as 30 warships and vessels, including the nuclear carrier "Dwight D. Eisenhower" and the NATO Standing Naval Force Atlantic, and more than 100 U.S., British, Canadian, Norwegian, West German, Danish, and Dutch naval and air force aircraft.

This stage tested the capabilities of the U.S. carrier to gain supremacy in the North Sea and to provide close air support to NATO ground forces in Central Europe. Air cover in the carrier maneuvering area was provided by the forces of the Atlantic zone of the NATO Joint Air Defense System in Europe (chiefly by British Air Force fighters). Carrier-based attack aircraft flew strikes on shore targets. U.S. KC-135 aerial tankers operating out of the British Mildenhall and Fireford air bases, provided midair refueling en route to the targets. Tactical fighters from the air forces of Denmark, West Germany, and other countries opposed the carrier-based aircraft.

In the estimate of Western military observers, the main objectives of the exercise were achieved.

THE OCEAN SAFARI-81 EXERCISE was held on 8-19 September (simultaneously with the Central Atlantic phase of the Ocean Venture exercise) in the central part of the Eastern Atlantic, the English Channel and the Iberian Atlantic.

Participants included the commands and staffs of indigenous and NATO Joint Forces in the Atlantic, English Channel, and Europe, 83 warships and more than 280 naval and air force aircraft of the United States, Great Britain, Canada, the FRG, Norway, Belgium, the Netherlands, Portugal, as well as France (a total of approximately 19,000 men).

Principal attention was devoted to re-formation (following its formation during the North Atlantic phase of Ocean Venture) of NATO's Striking Fleet Atlantic, specific-purpose forces and groups and their utilization in performing missions to gain supremacy in the Bay of Biscay and on the western approaches to the English Channel, providing air support to the NATO force grouping in the Central European Theater and defending sea lines of communication along the coast of Western Europe. The strike fleet formed up in the Bristol Channel, with air cover provided by British Air Force fighters. It contained more than 20 warships, including three carriers: the U.S. "Dwight D. Eisenhower" and the French "Clemenceau," which had steamed from the Mediterranean for the duration of the exercise (both general purpose), and the British "Invincible" (ASW). After completing assembly of NATO's striking fleet, which took more than 24 hours, the Blue force (NATO Joint Forces) proceeded to carry out sea supremacy missions. A central role was assigned to carrier-based aircraft, which flew massive bombing, strafing and missile strikes on Orange surface ship forces in the Iberian Atlantic and the Bay of Biscay.

When the exercise commenced, several naval strike and ASW groups were deployed on the western approaches to the English Channel and in the Bay of Biscay. These groups hunted "aggressor" submarines jointly with shore-based patrol aircraft. The ships of NATO's Standing Naval Force Atlantic were used primarily to protect the striking fleet assembly area against attacks by Orange-force submarines, while they were subsequently deployed on the western Channel approaches.

Within 2 to 3 days the carrier and ASW forces, supported by tactical air, had succeeded in forcing the Orange-force naval strike forces and submarines out of coastal waters and in establishing a secure zone of sea lines of communication along the coast of Western Europe from the port of Falmouth (England) to the port of Lisbon (Portugal).

In order to practice missions of protecting sea lines of communication, several convoys, made up of NATO member nation civilian freighters and tankers, were escorted from the port of Falmouth to Lisbon and back. The route of convoys from the west (from the Atlantic) was protected by multipurpose carrier groups, while convoy route antisubmarine defense was provided by ASW ships and aircraft. Convoys were provided air defense by British, Portuguese and French tactical fighters as well as carrier-based fighters.

Considerable attention was devoted to protecting convoy vessels against mines, especially when steaming in the Channel area. More than 20 minesweepers were assigned to this mission, including NATO's Standing Naval Force, Channel, reinforced to 8 ships. Vessels were escorted into and out of the port of Falmouth behind sweeps.

In the final stage of the exercise, some carrier-based attack aircraft were designated to attack "aggressor" land targets on French soil.

Just as in exercises of past years, U.S. Air Force B-52 strategic bombers, assigned to the Orange forces, were enlisted for minelaying in the Atlantic and in the Bay of Biscay.

A postexercise critique was conducted at Portugal's main naval base at Lisbon. In the estimate of foreign military experts, the main exercise objectives were achieved, but certain negative items were noted: accidents (causing the deaths of personnel), failure of combat equipment and weapon systems, and below-par proficiency on the part of the crews of certain ships and aircraft, as well as commmunications specialists.

In conditions of the present international tension, the NATO exercises held in the Atlantic were of a clearly marked provocational nature and had an anti-Soviet thrust. They were intended to further aggravate the situation in Europe, Central America, and throughout the world, to expand and accelerate militarist preparations. These exercises once again clearly demonstrated the endeavor on the part of international imperialism, particularly U.S. imperialism, to draw additional countries into NATO, as well as the intention to extend NATO into the South Atlantic. The French Navy took active part in these exercises, although France, as we know, withdrew from the NATO military organization in 1966.

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COMMENTS ON NATO AIR-CUSHION VEHICLE DEVELOPMENT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 75-79

[Article, published under the heading "Naval Forces," by Docent and Candidate of Military Sciences Capt 1st Rank P. Lapkovskiy: "Air-Cushion Vehicles and Their Combat Employment"]

[Excerpts] Plans to increase the might of the naval forces of the United States and its NATO partners devote considerable attention to development of promising ships and craft with dynamic principles of support, and particularly air-cushion vehicles (as is noted in the foreign press, they have potential to perform a broad range of missions, including engagement of submarines and surface ships, minesweeping, patrol, and carrying amphibious landing forces ashore.)

In the opinion of foreign military experts, air-cushion vehicles can influence to a significant degree the character of combat operations on the sea, since high speed capabilities enable them to reach specified areas quickly and make it possible to effect rapid redeployment from one area to another, when necessary to avoid contact with enemy surface ships, to bypass areas of heavy seas, intensive icing and other hazardous hydrometeorological phenomena, to accomplish assigned missions more rapidly, and consequently to shorten the time during which the enemy can implement his capabilities to organize countermeasures. A reduced degree of countermeasures will reduce the manning and weapon requirements for supporting the combat activities of these vehicles. At the present time air-cushion vehicles are subdivided into two types -- amphibious, and skeg-type.

As is reported in the U.S. press, the U.S. Navy has been conducting research for quite some time in the area of building large air-cushion vehicles capable of carrying aircraft. The firms Bell and Lockheed, for example, did preliminary design work on such vessels for the U.S. Navy. It was established that the high speed of an aircraft-carrying air-cushion vehicle substantially reduces the takeoff roll both of conventional and all STOL aircraft. The engineering studies and design projects indicated that the optimal air-cushion vehicle would weigh 8000-10,000 tons, carry 12-17 aircraft, and would be equipped with four aircraft lifts (two each forward and aft), which would make it possible to launch 12 aircraft in 21 minutes and recover the same number in 15-16 minutes. The aircraft lift platforms can be used as pads for VTOL aircraft.

The French company Sedam has designed an aircraft-carrying ASW air-cushion vehicle with ASW and artillery weapons, sonar gear, and ASW helicopters.

Foreign military experts believe that air-cushion vehicles are one of the most promising new areas in naval architecture. Today's air-cushion vehicles are merely prototypes of future vehicles. Their development, as is emphasized in the Western press, up to the year 2000 will probably proceed in two independent directions: one -- improvement of small amphibious air-cushion vehicles, and the other -- increase in the weight and speed of skeg-type air-cushion vehicles. According to expert estimates, the weight of amphibious air-cushion vehicles will not exceed 800 tons, and that of skeg-type vehicles -- 10,000 tons. They will attain speeds of 100-120 and 80-90 knots respectively.

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COMMENTS ON U.S. NAVY RADIOELECTRONIC WARFARE EQUIPMENT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 81-82

[Article, published under the heading "Naval Forces," by Candidate of Technical Sciences Engr-Capt 2nd Rank (Res) F. Voroyskiy: "The AN/SLQ-32(V) Electronic Warfare System"]

[Text] In recent years the U.S. Navy has devoted considerable attention to equipping ships with electronic warfare gear and its employment.

U.S. Navy authorities believe that the Raytheon AN/SLQ-32(V) will become the most widely used EW system in the 1980's, a system which is to be installed in warships of the principal types, as well as amphibious warfare ships and auxiliary vessels. The system has been under development since 1973, and testing of an experimental model installed in the cruiser "Leahy" began in 1978, tests which are still continuing. Certain design deficiencies are being determined and corrected in the course of testing, but in spite of this fact, in 1979 the Navy proceeded to equip the first 20 ships with this system.

The AN/SLQ-32(V) system is of modular design and comes in three versions, which are installed in ships of different types and differ in performance characteristics, weight and size (see table) [not included].

The (V)1 version is the basic model. It gives a warning when the ship is being illuminated in the frequency band at which enemy antiship radar-homing missiles operate, determines the bearing to and automatically classifies detected emissions, and in semiautomatic mode issues control commands to the Mark 36 passive jamming system. By 1985 this system is to be installed in 107 small-displacement amphibious warfare ships and auxiliary vessels.

The (V)2 version detects and classifies enemy shipboard radars in three frequency bands. It includes, in addition to the equipment of the first version, warning and direction finding equipment operating in the frequency bands of antiship missile firing aircraft and ship detection and target designation radars. This system is to be installed in 113 ships (chiefly "Oliver Hazard Perry" class frigates and "Spruance" class destroyers).

The (V)3 version includes all the equipment of the second version plus an additional active jammer against antiship missile radar homing heads and the onboard radars carried by the platforms which launch them. This version is being installed in 64 ships ("Leahy", "Belknap," "California," and "Virginia" class cruisers, large amphibious warfare ships, and certain types of auxiliary vessels).

Figure 1 [not reproduced] contains a layout diagram of the principal components of the AN/SLQ-32 (V)3 system, while Figure 2 [not reproduced] is a photograph of the EW system operator's console in a ship's combat direction center. The tactical situation display screen measures 205 x 254 mm. Positioned in the center of the screen are the ship and friendly forces radio-frequency emission sources, the middle circular zone contains data on the position and radiation characteristics of guided missile radar homing heads, while the outer ring contains radiation characteristics of operating radars of guided missile launch platforms.

All versions of the AN/SLQ-32(V) are adapted for feeding data (in semiautomatic control mode) to mortar-type Mark 36 RBOC (Rapid Bloom Off-Board Countermeasures) units.

The system's receiving-transmitting antenna is mounted on a stabilized platform. The antenna array receives and transmits signals in two frequency bands. Its receiving elements (for each frequency subband) form a radiation pattern consisting of 140 lobes in a horizontal plane, covering 360 degrees. Lobe width in the vertical plane is 90°. The signal received by each lobe is amplified in a separate receiver channel.

In response pulse jamming mode a signal received from a hostile radar is amplified and time-delay reradiated by the transmitting antenna.

A large number of response jamming signal forming channels makes it possible to jam simultaneously several hostile detection and control radars. An optimized type of jamming is directed toward each countermeasures target, ensuring maximum effectiveness of suppression. System response is 1-2 seconds. The overall jamming power can be adjusted from several kilowatts to 1 megawatt.

It is noted in the foreign press that reconnaissance receivers designed on the principle described above are highly sensitive, providing close to 100 percent radar signal interception probability.

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COMMENTS ON U.S. NAVY SHORE-BASED AVIATION REPAIR BASES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 82 (signed to press 6 Jan 82) pp 83-86

[Article, published under the heading "Naval Forces," by Engr-Capt 1st Rank (Ret) P. Osipov and Engr-Capt 2nd Rank A. Fedurin: "U.S. Naval Aviation Shore Repair Base"; passages rendered in all capital letters printed in boldface in source]

[Text] U.S. military and political leaders view aircraft carriers and the aircraft based on them as reserve strategic forces and assign them an important role in their militarist preparations and gendarme actions in various parts of the world.

The combat effectiveness of an aircraft carrier depends to a significant degree on the combat readiness of its air wing. Naval command authorities, expending vast funds on building and operating carrier aircraft and helicopters, devote considerable attention to improving the network of shore air bases and aircraft repair facilities, which are of considerable importance in accomplishing the task of maintaining carrier-based aircraft at a high level of combat readiness. They are usually located in the vicinity of or on naval bases at which carriers are based, and comprise common facilities with the bases.

U.S. NAVAL AIR STATIONS (there are a total of 51, of which 7 are Marine) are located both in the continental United States (on the Pacific and Atlantic coasts) as well as outside the United States.

Every squadron of carrier-based aircraft (helicopters), just as shore-based and Marine fixed-wing aircraft and helicopters, is assigned to a designated shore air station. When a carrier arrives at its home base for repairs, upgrading and resupply, the aircraft of its air wing fly to their naval air station (in many cases before it arrives at its base). At their air station fixed-wing aircraft and helicopters also receive maintenance, repairs, upgrading and, in addition, are furnished with all types of supplies, including spare parts and various materials), operation and maintenance documentation for supporting the activities of naval air subunits. The squadrons then proceed with combat training.

First and second category maintenance and repairs on fixed-wing aircraft and helicopters* and a portion of the upgrading work is done by the naval air station maintenance department. Aircraft requiring category three maintenance are sent to naval aircraft maintenance facilities. The supply department is responsible for providing the needed spare parts and materials for aircraft maintenance and repairs.

Aircraft receive maintenance and repairs in special hangars. In these hangars the aircraft of each air wing are assigned permanent locations and the requisite equipment. Supply rooms containing the most frequently requested spare parts are provided directly in these hangars. The principal U.S. aircraft companies as a rule maintain representatives at naval air stations to handle problems which arise in the process of maintenance and repair, as well as to expedite supply.

As an illustration, we present below information on two naval air stations.

Oceana Naval Air Station is located on the main base of the Atlantic Fleet -- Norfolk -- and occupies approximately 3000 hectares. As many as 25 squadrons are assigned to it.

According to figures in the U.S. press, the naval air station's maintenance facility has 650 personnel. It has several shops, including an engine repair shop (employing approximately 100 persons). In a month's time the shop overhauls up to 30 aircraft engines, which are then static-tested on a test bed.

Barbers Point Naval Air Station is located in the Hawaiian Islands. It has an engine maintenance shop (up to 345 units per year), an avionics maintenance shop and a rescue equipment maintenance shop. This naval air station maintains a squadron of transport aircraft which deliver to forward bases replacement parts and equipment for fixed-wing aircraft and helicopters.

Naval air station specialists help check the combat readiness of a carrier's aircraft before it is placed on fleet operational status.

U.S. NAVY AIRCRAFT REPAIR FACILITIES are large modern enterprises. The Navy has seven of these, six of which are under the U.S. Navy Air Systems Command: two are located on the U.S. West Coast (North Island and Alameda), and four on the East Coast (Norfolk, Pensacola, Quonset Point, and Jacksonville). The Cherry Point facility, which is on the East Coast, is under the Marine Aviation Command. In most cases the names of repair facilities and naval air stations coincide (if they are collocated), while in other instances facilities bear the names of the towns in which they are located. Some repair facilities were established on the base of naval air station maintenance departments. Basic data on repair facilities are contained in the table [not included].

Repair facilities have administrative offices, a design office, production shops, and test sections. Administrative offices include the following

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* For more detail, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 7, 1980, pp 68-73 -- Ed.

departments -- planning, production, technical, engine repair, weapon systems, quality and reliability, plus others.

The principal shops are the following: aircraft disassembly, parts washing and cleaning, aircraft assembly, engine repair, helicopter main rotor blades, avionics, hydraulic systems and bearings, compressed-air equipment testings, fiberglass, machine shop, forge, tool shop, paint shop, etc. The shops are equipped with numerically-controlled machine tools, test benches for avionics testing and adjustment, electron-beam welding equipment and equipment for plasma applying aluminum or titanium, plus other modern equipment. Figure 1 [not reproduced] shows the aircraft assembly shop at the Alameda repair facility.

A repair facility is usually headed by a naval air officer of captain 2nd rank equivalent, and the shop -- captain 3rd rank. According to figures in the U.S. press, military personnel do not exceed 50, half of whom are in supervisory positions, and some of whom are in the flight testing group. Up to 25 percent of the civilian specialists are engineers and technicians.

Each aircraft repair facility has a work force of 3300-6400 persons, with a total of approximately 30,000 at all facilities. According to figures in the foreign press, aircraft repair facility personnel are highly-qualified specialists in many areas of specialization. The Alameda facility, for example, employs workers of 160 different specialties, and 60 engineer-technician personnel.

Each aircraft repair facility specializes in the repair of fixed-wing and rotary-wing aircraft (4 -- 6 types, and at Quonset Point -- 11 types), engines (up to five different models), aircraft guided missiles (up to 3 types), aircraft assemblies, and manufacture of spare parts. In recent years helicopter repairs have been concentrated at the Pensacola facility, which also handles Air Force and Marine helicopters.

When necessary repair facilities perform category two repairs on fixed-wing aircraft and helicopters, repairs which are usually performed by naval air station departments or aircraft carrier shops.

On the basis of a cooperative agreement between the different services, aircraft repair facilities repair aircraft and engines for the U.S. Air Force and the navies of other countries flying U.S.-built equipment.

The production capacity of each plant facility is sufficient to repair (major overhaul) and upgrade each year 200-500 aircraft and 120-750 aircraft engines, and 30,000-100,000 aircraft and engine parts and assemblies. They also perform emergency aircraft repairs. In addition, the Alameda facility repairs and upgrades catapults and catapult systems, as well as aircraft carrier landing-assist devices.

North Island and Alameda are the largest aircraft repair plant facilities. The value of basic equipment at the former is estimated at 100 million dollars, and its fiscal 1977 budget was 195 million dollars. The Norfolk aircraft repair plant facility budget in that same fiscal year was 133 million dollars.

As is noted in the foreign press, the availability of high production-capacity plant facilities enables naval command authorities to utilize aircraft intensively throughout their entire life cycle and to maintain the prescribed number of combat-ready aircraft (with a smaller total number in the Navy inventory).

Just as at naval air stations, permanent representatives of the principal U.S. aircraft companies are assigned to aircraft repair plant facilities to handle technical and organizational problems which arise in the process of maintenance and repair.

Fixed-wing aircraft and helicopters are upgraded at aircraft repair plant facilities in conformity with the programs specified for each type of aircraft. A large number of aircraft are upgraded repeatedly, as a result of which their service life is increased by 8-10 years. Some upgrading programs are carried out over a period of several years.*

Aircraft repair plant facilities also repair aircraft on carriers or at naval air stations located overseas. It is reported, for example, that in 1976 alone teams of repair specialists from the North Island aircraft repair facility went into the field on 798 occasions to check aircraft malfunctions and made 680 repairs on the spot.

Repair of aircraft and engine assemblies and components (for example, midair fuel transfer and receiving devices, individual avionics modules, weapons) comprises a substantial part of the activities of aircraft repair plant facilities. Renovation of individual items and equipment is performed on request by the Naval Aviation Supply Center (Philadelphia), which furnishes supplies to the fleets.

Aircraft repair plant facilities also manufacture spare parts for aircraft and engines no longer in production. Each facility specializes in the manufacture of spare parts for specific types of aircraft and engines. For example, North Island manufactures spare parts for C-2, E-2 and F-4 aircraft, J79, T58, and T64 engines, and for 210 different avionics systems.

In the estimate of Navy experts, manufacture of spare parts at aircraft repair facilities is cheaper than at privately-owned companies, and in addition they can be delivered faster. At the same time some repair jobs, such as on a number of avionics assemblies, are farmed out from aircraft repair plant facilities to private companies.

Aircraft repair procedures at repair plant facilities are strictly regimented. Each quarter aircraft repair and arrival schedules are prepared, which are coordinated with the fleet representative of the Navy Air Systems Command (Pacific or Atlantic). Aircraft are ferried to the maintenance facility on the day before the overhaul is scheduled to begin. Facility specialists inspect them in advance at the base location and evaluate their condition.

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* For more detail, see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 2, 1980, pp 77-82 -- Ed.

Aircraft are again inspected at the overhaul facility. Particular attention is focused on the forming of cracks and corrosion on structural members. All noted defects and malfunctions are entered in a special log. Also entered is a list of repairs suggested by air squadron personnel and prescribed by the upgrading program for that model of aircraft. Inspection and preparation of the list takes from 2 to 4 days.

The plant aircraft overhaul process is determined in advance. For F-14 aircraft, for example, it was elaborated 2 years prior to overhauling the first of these aircraft.

The aircraft is washed and cleaned, avionics removed (stored or sent to the shop for maintenance), as are gun armament and wings. Engines and fuel tanks are removed, thoroughly washed and put away. After this the aircraft is towed to the overhaul lines, where it is disassembled. Panels (there are approximately 200 on the F-14), assemblies and devices are removed to give easier access to equipment. When necessary they are sent to the shop for repair. At this stage a team of maintenance specialists inspects in detail and evaluates the condition of the airframe and aircraft equipment (Figure 2) [not reproduced]. They determine the degree to which the previous upgrading program was completed, compare equipment identification numbers, examine and evaluate the possibility of carrying out the suggestions of air squadron personnel on aircraft changes. The results of the inspection are reflected in the overhaul sheet. All this takes about a month.

Following overhaul and repair of airframe, engines and individual components, the aircraft is assembled, after which personnel test the quality of installation of electrical circuits and their operation with the aid of a special test bench. After inspection, the fuel system is installed and tested (fuel transfer pumps, fuel tanks, fuel gauges), which takes four days. Hydraulic systems are installed and tested for seal. Aircraft cockpit seal is tested. Access panels are replaced. The overhauled engines are installed. This stage takes about a week. Operation of avionics is tested with an external power supply.

After overhaul is completed, the aircraft is taken out of the shop, and all aircraft systems and devices are tested, using the aircraft's own power supply. Aircraft weight and balance data are recorded, the aircraft is painted, and warnings and instructions are stencilled on (there are 850 of these on the S-3A Viking). After being flight-tested, the aircraft is returned to the air squadron, which sends the overhaul facility a special report acknowledging delivery and containing an evaluation of the quality of the overhaul and repairs performed.

The duration of a plant overhaul depends on the type of aircraft and extent of upgrading work performed, and runs approximately 4-4.5 months. Plant overhaul is specified at 127 days for F-14 aircraft. F-14 engine overhaul requires 40 days.

A plant overhaul for F-14 aircraft is specified after 30 months of operation, during which an aircraft logs from 500 to 700 hours and makes 700-800 landings, 200-250 of which are carrier landings.

It is reported that the labor requirements of plant overhaul of an S-3A aircraft at the Alameda overhaul facility run 5200 man-hours, and 13,000 for C-118 aircraft; labor runs 1500 man-hours for A-4 aircraft at the Pensacola facility.

The cost of a plant overhaul of an E-2 aircraft at the North Island facility is 480,000 dollars, and 72,000 dollars for a CH-46 helicopter.

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